APRIL

An All-Electric Set—Page 655

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SEE PAGE 544

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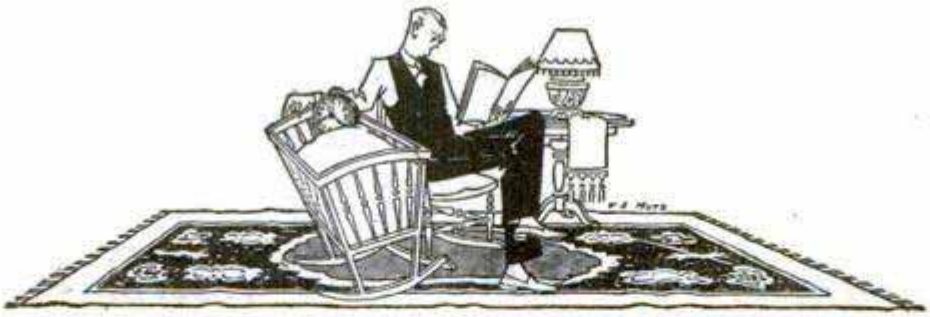

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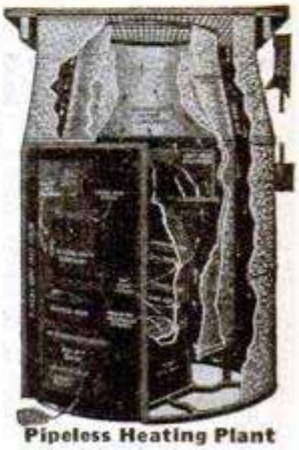

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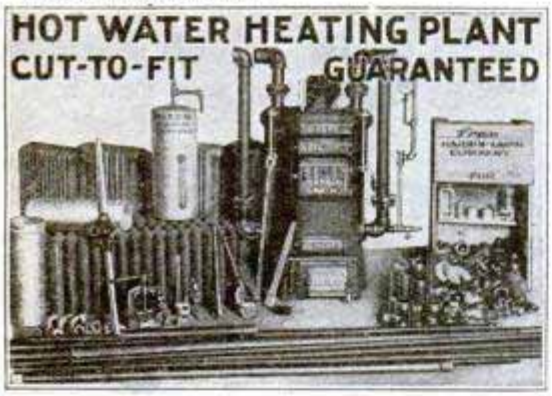

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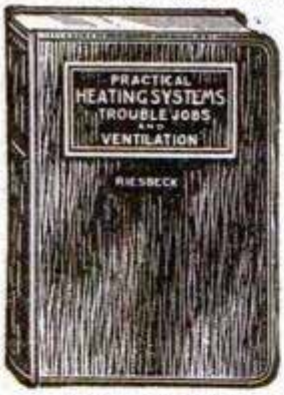

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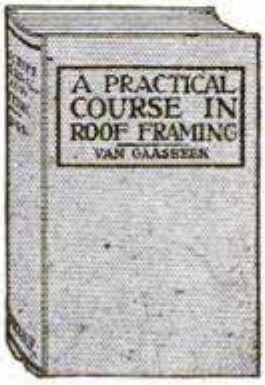

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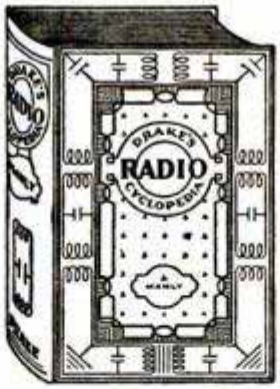

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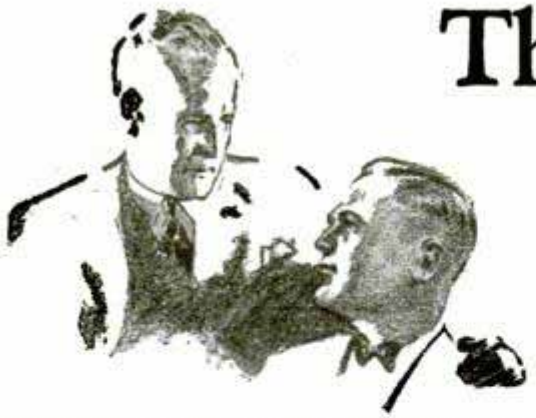

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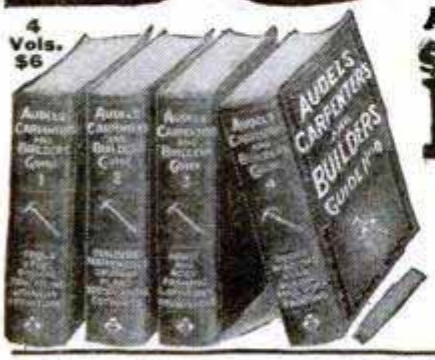

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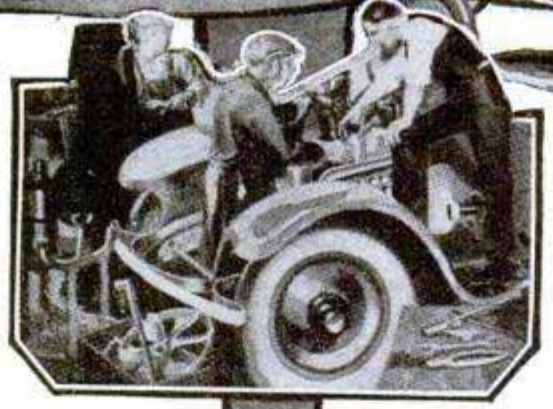

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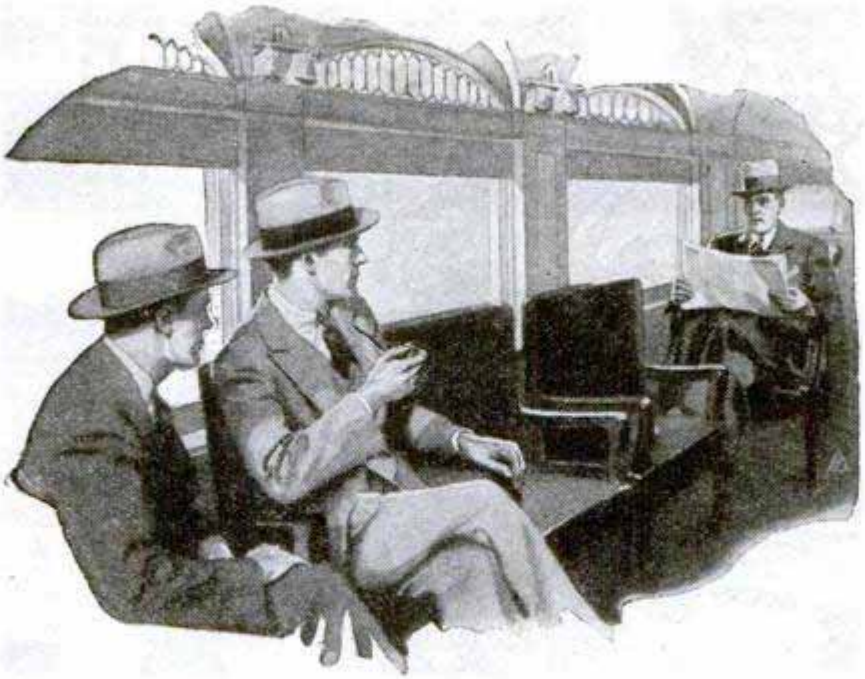

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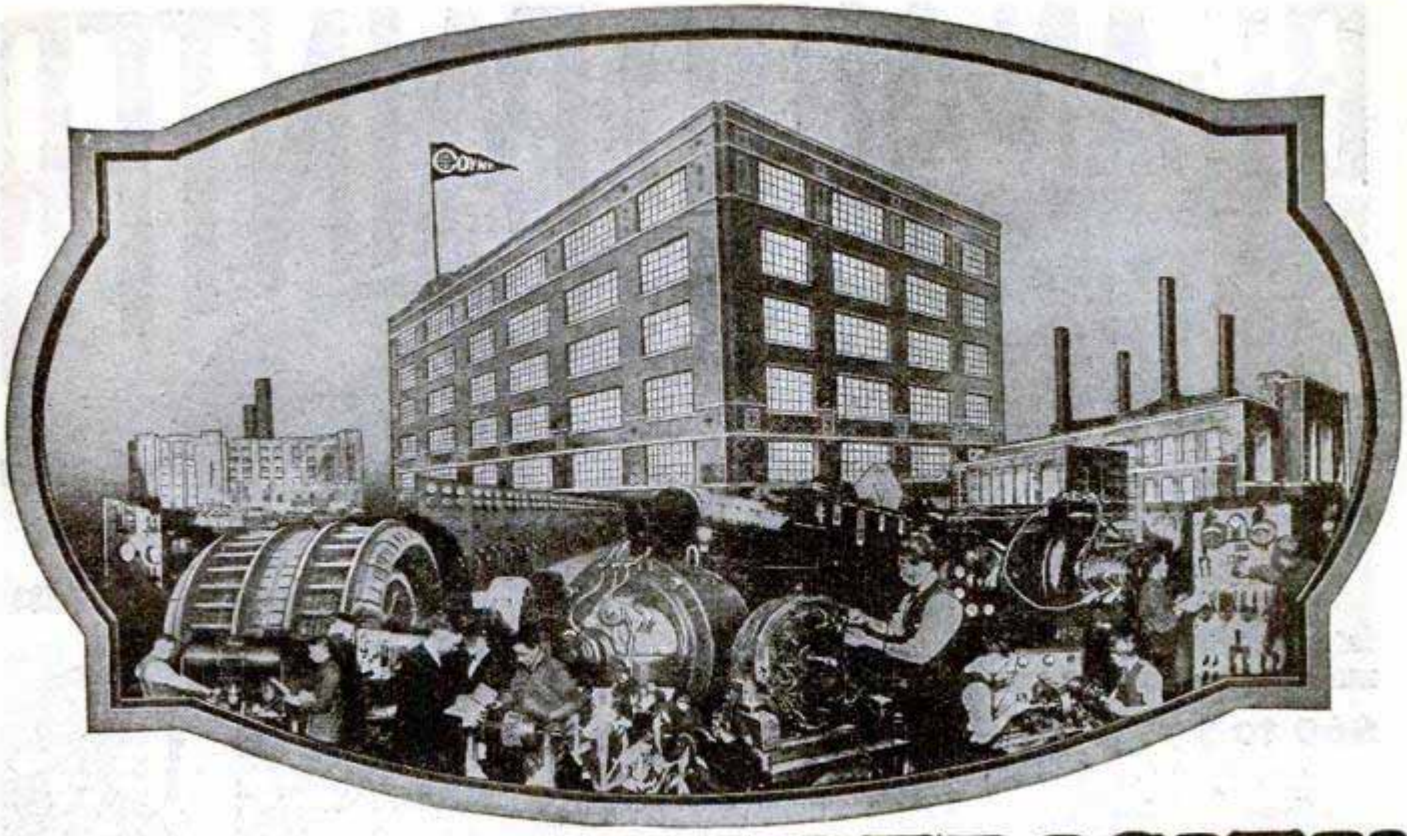

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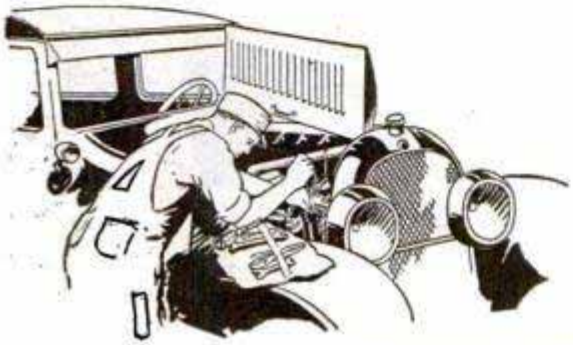

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Send me for 10 days' free examination the Croft Library of Practical Electricity. If satisfactory, I will send you $1.50 in 10 days and $2 monthly until the special price of $19.50 is paid. If not wanted, I will return the books at your expense. (To insure prompt shipment write plainly and fill in all lines).

Signed.....

Address.....

City and State.....

Position.....

Employer.....P.M.-4-28

Stop and think for a moment. How would you like to have your own spending money—and besides that win such prizes as a bicycle, sporting goods and scout equipment? You can do both by being a Crowell Junior Salesman.

Every week Crowell Junior Salesmen deliver three of the best known magazines to regular customers. It takes but a few minutes of their spare time and does not interfere with their school work. You can do the same if you just stop for a moment. Look at the coupon—Sign your name and address—Mail it at once.

Mr. Jim Thayer, Dept. 56,
The Crowell Publishing Co.,
Springfield, Ohio.

Dear Mr. Thayer: I want to know more about being a Crowell Junior Salesman.

Name.....

Address.....

Town.....State.....

Earle Liederman Says:-

1 "He Can Make Anyone Strong"
2 "He Can Put One Inch on Your Arm in 30 Days"
3 "He Can Put Two Inches on Your Chest in 30 Days"
4 "He Will Give You a Physique To Be Proud Of"
5 "He Will Add Many Healthy Years To Your Life"
6 "He Will Make You The Popular Idol of Your Gang"
7 "He Will Take The Wrinkles Out of Your Spine"

He Doesn't Promise— He Guarantees

He has done all these things and more for thousands of others. That's why he backs up his statements with an iron-clad guarantee. You want muscle—you want health and you want the pep that only supermen have. You can have them all—almost as quick as a wink!

Put Him To The Test

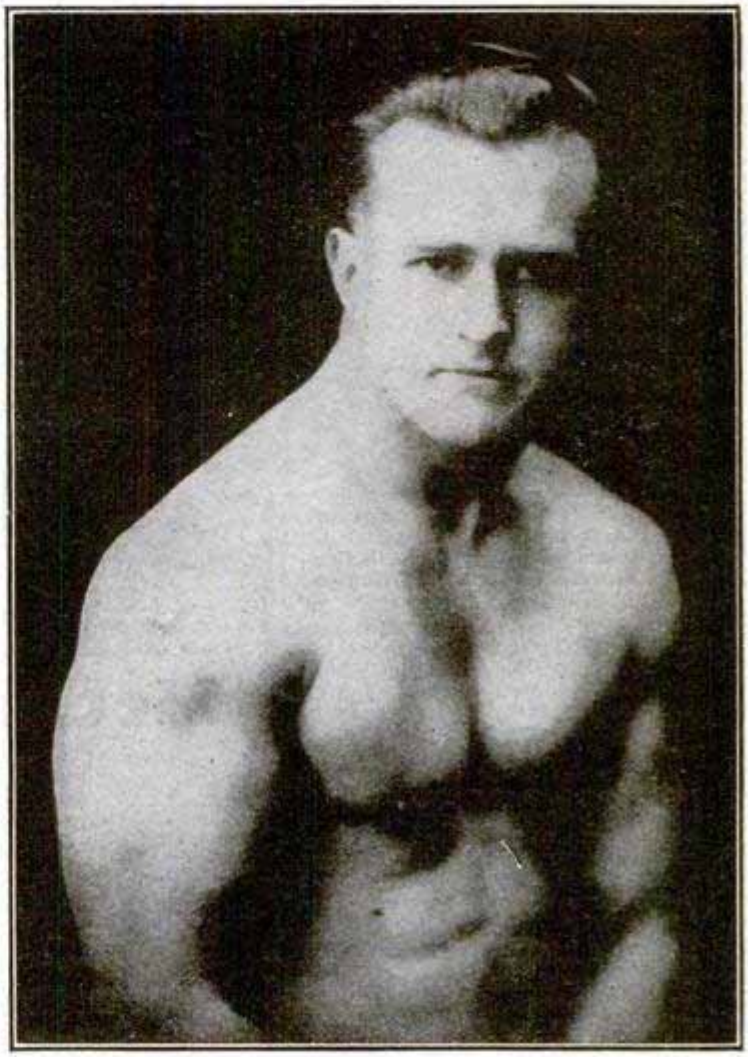
An ounce of action is worth a thousand words. Make him prove that he can put one inch of muscle on your arm and two inches on your chest in less than 30 days. Make him prove that he can make anyone strong. Make him prove that he can give you a physique to be proud of. Make him prove that he will add many healthy years to your life. Make him prove that he will make you the popular idol of your gang. Make him prove that he will take the wrinkles out of your spine. He likes to be challenged because he is sure he can make good. Put him to the test. His guarantee protects you against risk.

You Can't Lose

If Liederman doesn't make good every single promise, you are out nothing. He takes all the risk. He has been guaranteeing to make physical marvels out of all sorts of muscleless men, for many years—that's why they call him the muscle builder. You'll call him that, too, before 30 days roll by. Write him today.

He Never Fails

There must be a reason for his success—there is. He discovered the secret of muscles and health. And he knows how to give help to others. He doesn't give you a lot of "don'ts." He tells you what to do. He gives you the "know-how" of strength getting. That's why he never fails. That's why you should write to him today.



EARLE E. LIEDERMAN, *The Muscle Builder*
Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," "Here's Health," "Endurance," etc.

Send For My New 64 Page Book "Muscular Development"

IT IS FREE

It contains forty-eight full-page photographs of himself and some of the many prize-winning pupils he has trained. Many of these are leaders in their business professions today. He has not only given them a body to be proud of, but made them better doctors, lawyers, merchants, etc. Some of these came to him as pitiful weaklings, imploring him to help them. Look them over now and you will marvel at their physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. The book is yours. He wants you to have it with his compliments. Keep it. This will not obligate you at all, but for the sake of your future happiness and health, do not put it off. Send today—right now before you turn this page.

Earle E. Liederman
Dept. 2004 305 Broadway, New York City

DON'T SEND ONE PENNY

—

YOUR NAME AND ADDRESS ON A POSTAL WILL DO

EARLE E. LIEDERMAN
Dept. 2004, 305 Broadway, New York City

Dear Sir: Please send me, without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

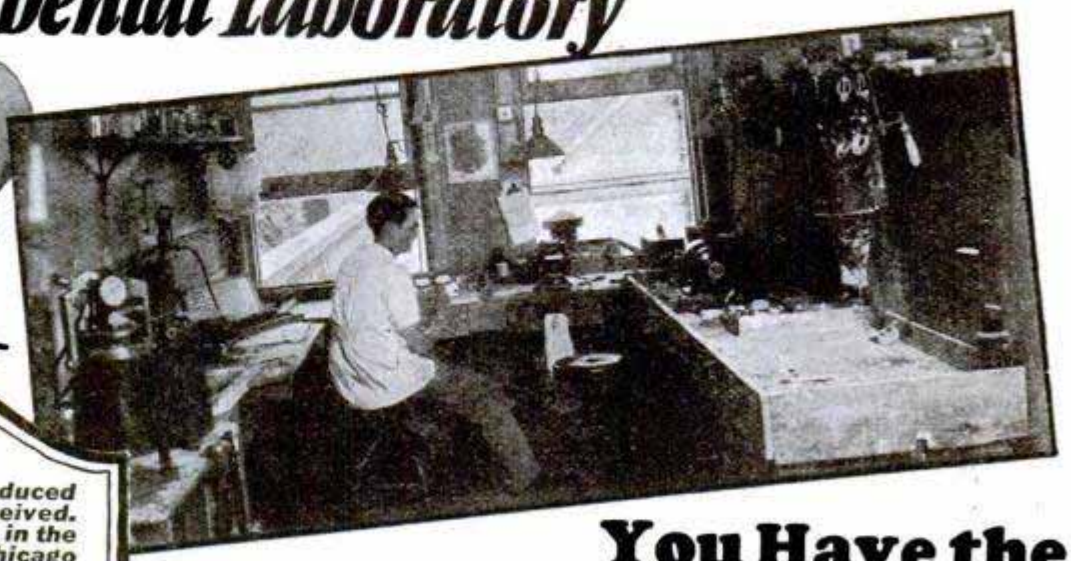
Name.....

Street.....

City..... State.....

From $30 a Week Bookeeper to $150 A Week *as Owner of Dental Laboratory*

WILLIAM CLAYTON
McCarrie Graduate
And His Own Dental Laboratory



The following is reproduced from a letter we received. The original is on file in the McCarrie School in Chicago

Gentlemen:

I was bookkeeping up until January, 1924, at $1500 per year, and while having lunch one noon, I picked up a "Popular Mechanics" and ran across your ad, which fascinated me very much. Although making a good living at the time, I was not entirely satisfied, so I wrote for your literature.

Upon receipt of the above, and having read it very thoroughly, I could not help but admit I was quite enthused. Two weeks later I arrived at your school. Completing the course in August, I returned home where I received a position in a laboratory. After a few months experience, I got connected with Dr. L....., with whom I stayed two years, resigning my position to open a laboratory of my own, October 15, 1926. I have ten dentists on my list which net me about $150.00 of business per week, with business increasing rapidly.

Thanking you hardly expresses my appreciation of your most thorough course. Your promises were more than fulfilled, and in closing I want to state that there is a large field open for your graduates. I remain,

A Successful McCarrie Graduate.
(Signed)
William H. Clayton.

You Have the Same Opportunity–Learn Mechanical Dentistry

Follow in Clayton's footsteps! Read his inspiring letter telling how he jumped from $30.00 a week to $150.00 a week! Many McCarrie graduates are doing the same! Larson writes, **"Our laboratory has averaged about $800.00 a month profit since first of year—not bad for two of your boys who have been in business for only a year."** Ostrander says, **"I earned as high as $45 profit in a single day."** Another McCarrie man sends us this message: **"No trick for me to make $20.00 a day."** Our free book tells many more amazing success stories like this—write for it today!

Day or Night Schools—All Personal Instruction—No Books—No Classes—Work Your Way Thru School—We Help You To Spare Time Job

Enter this fascinating profession—assure yourself steady employment the year round—work that is highly congenial and dignified! Associate with a fine class of people! Earn a splendid income! We have hundreds of testimonial letters on file from enthusiastic McCarrie men who have made good.

Will you accept this big opportunity? The dental profession needs you. It has grown so fast that the demand for mechanical dentists far exceeds the supply. Here is specialized training of the finest sort! No mechanical skill necessary—no special educational requirements—and a quick, sure reward!

SEND FOR INTERESTING BOOK

Read absorbing facts about Mechanical Dentistry—the laboratory bench work that the dentist turns over to the laboratory worker, the making of plates, crowns, bridgework, etc.—why 64,000 dentists need laboratory work—how we train you in a few months, day or night, for this uncrowded, moneymaking field!

McCarrie Schools are located in Chicago, Detroit, Cleveland, Philadelphia and Boston.

Work Your Way Thru School. We Help You Get Spare Time Job.

MAIL COUPON TODAY

No obligation—no cost! Mail coupon today and get your free copy of this handsomely illustrated, interesting book giving complete details of Mechanical Dentistry—our low rates and easy terms. **Send coupon today!**

McCARRIE SCHOOL OF MECHANICAL DENTISTRY
Dept. 160 1338 S. Michigan Ave. CHICAGO, ILL.

FREE BOOK

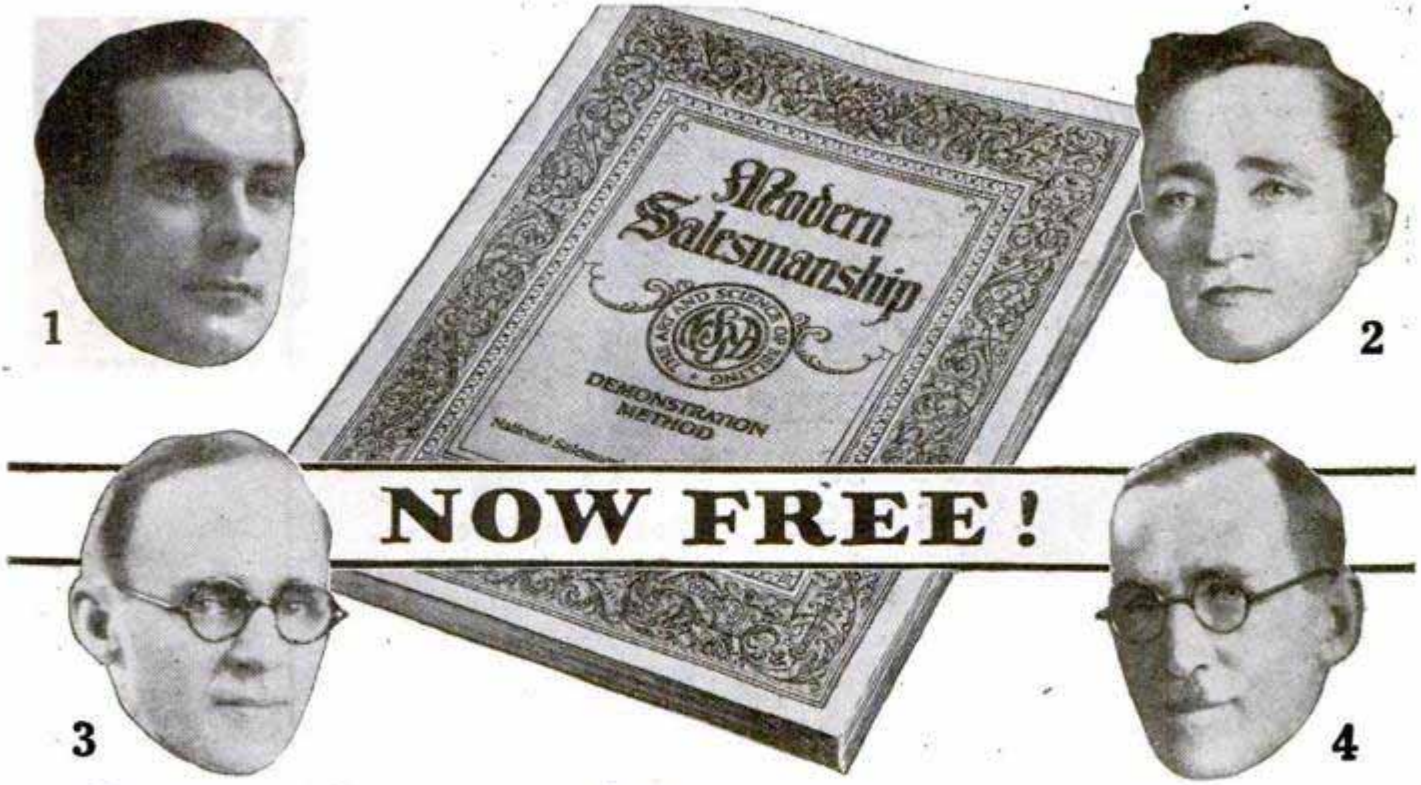
McCarrie School of Mechanical Dentistry,
1338 S. Michigan Ave.,
Dept. 160 Chicago, Ill.

Without obligation, please send me your free Book with complete information about how I may become a Mechanical Dentist, how you will help me open a Laboratory, how you will help me find a job while I take my training, etc.

Name.....

St. No. or R. F. D.....

City.....State.....



They Found This Book Was Worth a Year's Pay!

—and so Have Thousands of Others

A BOOK? Worth a year's pay? Worth from $1,000 to $5,000 to most any man? Ridiculous you may say. All right, doubt it if you will, but remember one thing. The men whose pictures you see above, and thousands of others whose success records have been equally startling, perhaps doubted it too. But that didn't stop them investigating, sometimes even in the face of ridicule from "wise-cracking" friends. They sent for "Modern Salesmanship." They read the vivid, inspiring message contained within its sixty-four fascinating pages. They learned of a new easy way to enter the highest-paid profession in the world on an even footing with men of five and ten years' experience. And the direct result was the same in each case—increased salaries, broader vision, new luxuries! No wonder a year's pay now seems a modest valuation for the book that opened their eyes to such amazing opportunities!

The Secret of Earning Big Money

Figure it out for yourself. Most jobs are worth just so much and no more. No matter how hard a man works, he just can't get his salary past the limit set for certain classes of routine labor. The salaries of clerks, bookkeepers, mechanics, laborers, etc., are limited, because there are always plenty to fill the ranks. The opportunity for advancement is practically negligible.

But how different with Salesmanship! Master Salesmen are the very life-blood of any business. Upon their efforts depend the profits which any concern makes. No company can exist without them—and there is almost no limit to the importance which a good salesman can achieve in the eyes of the firm employing him.

Proof That You Can Become a Master Salesman

Yet despite all the wonderful advantages enjoyed by the Master Salesman, proficiency in this fascinating field is surprisingly easy for any average man to attain—without losing a day or a dollar from his present position. During the past twenty years, the National Salesmen's Training Association has developed thousands of every-day, ordinary men into Master Salesmen, able to earn incomes ranging from $5,000 to $10,000 a year and even more. No matter what your present occupation is, there is no reason why you cannot make good as a salesman. There is no reason why you cannot quickly learn the simple principles that have guided others to just such success as you have often dreamed of for yourself. "Master Salesmanship" will point the way.

A Gold Mine of Valuable Information—FREE

If we were asking several dollars a copy for this remarkable book, you might hesitate. But it is now FREE. And since the information which it contains may be worth so much to you, it is surely worth while to fill in and mail the coupon below. This coupon will bring a copy to you without cost or obligation of any sort. Take this opportunity now to find out exactly what your chances in the selling profession are—what membership in this Association means—and why our Free Employment Bureau received calls for more than 50,000 salesmen last year! Mail the coupon to-day!

NATIONAL SALESMEN'S TRAINING ASSOCIATION
Dept. D-100
N. S. T. A. Bldg. Chicago, Ill.

$10,000 A Year

1 "N. S. T. A. training has enabled me to learn more, earn more, and BE more. My earnings this year will exceed the 5-figure mark."
C. V. Champion, Danville, Ill.

$1,000 In A Week

2 "Before joining the N. S. T. A. I was making $200 a month. Last week my earnings amounted to over $1,000."
O. D. Oliver, Norman, Okla.

$7,500 A Year

3 "Three years ago I was working in a shop for $15 a week. To-day I am making $7,500 a year. N. S. T. A. training has put me where I am to-day."
C. W. Birmingham, Dayton, Ohio

$7,286 Last Year

4 "I was working as a clerk earning $1,000 a year when I enrolled with N. S. T. A. Last year my income tax showed earnings of $7,286."
Frank J. Walsh, Springfield, Mass.

National Salesmen's Training Association,
Dept. D-100, N. S. T. A. Bldg., Chicago, Ill.

Please mail me Free your illustrated book, "Modern Salesmanship" and particulars of membership in your Association.

Name.....

Address.....

City.....State.....

Age.....Occupation.....

Before Kenneth McCarty Mailed that Coupon He was an $18.00 Clerk—

Today His Income is $85.00 a Week

After completing the course he wrote us: "Yours is the finest course ever presented for the Tenor Banjo. Before I enrolled with you, I knew nothing whatever about music. I was earning $18.00 weekly clerking in a store. **Little did I realize the opportunity that had come.** I took up the course just for fun. But here I am playing in one of the best orchestras in Western Michigan and **making $85.00 a week.** Your course and your kind co-operation have made me a professional Tenor Banjoist."—*Kenneth McCarty, Parkview Hotel, South Haven, Mich.*

Play for Fun or $5,000 a Year

Whether a salary of $65 to $100 a week—or spare time playing at $5, $10, $15 or more a night—interests you or not—think of the fun in store for you. In one to three months we can train you at home to play this marvelous, melodious instrument with a fine easy skill that will make you the envy of all other eyes. Think, too, of the pleasure of being able to express yourself musically when alone! You're passing up the **best times** of your life if you pass up an opportunity like this to learn at slight cost and with no inconvenience at all the world's most popular instrument. DON'T DO IT! Decide NOW to learn more about The Play-Way—the quickest, surest short-cut ever devised to social and professional success.

You Get Phonograph Records, Too

Every selection of the course, fifty-five in all—comes to you on a phonograph record. You hear the instructor's playing just as though he were right at your side. The Play-Way is different, interesting, FOOL PROOF. Get the good news the coupon brings. SEND FOR IT NOW!

FREE Book Tells How

Send at once for "The Play-Way to Popularity and Big Pay." Learn all about our unique method of training you at home, about the big, professional size Tenor Banjo, Phonograph Records and complete Outfit that we send you along with your very first lesson. Undreamed of possibilities for pleasure, popularity and big pay are open to you the minute you "become good." The book below is your first step. Take it now. Clip the coupon while it's here before your eyes.

Get Big Free Book

A. F. Bloch, President
NEW YORK ACADEMY OF MUSIC,
Studio 1048, 100 Fifth Avenue,
New York City.

Send me the book that started McCarty. No obligation whatsoever on my part, understand.

Name.....

Address.....

BE A RAILWAY TRAFFIC INSPECTOR

EARN UP TO $250 per month SALARY PLUS EXPENSES

During the last nine years 99.4% of our graduates have been offered positions as Traffic Inspectors at definite salaries, plus expenses, a few days after completing their studies. Traffic Inspectors start at $120 or more per month and rise rapidly to $175, $200 or $250 per month. As a Railway Traffic Inspector you are practically your own boss—see new faces and places every minute, report only to high officials and are rapidly advanced. It's healthful, outdoor work with regular hours.

Positions Open — Waiting for You

Here's one of hundreds of letters from our students:

Dear Sir:

After completing a course in Traffic Inspection through your school I was immediately put to work on an assignment. I have been engaged in this work ever since and am collecting approximately $180 per month at present.

** * * To anyone desiring an outdoor life with work that is interesting I recommend a course in Traffic Inspection through the Standard Business Training Institute.*

(Signed) T. S. Adams.

Send for FREE Booklet

Learn about this great, uncrowded profession, and our refund and employment agreement today. Our free booklet tells all about Traffic Inspection—how we have been able to assist our graduates to positions at definite salaries—why they are so soon promoted to positions paying up to $250 per month—and what we can do for you.

STANDARD BUSINESS TRAINING INSTITUTE
Division 2 **Buffalo, New York**

1,000 Hotel Positions Open!

HOTELS, restaurants, clubs, apartments, hospitals, institutions, schools and colleges everywhere need trained men and **women.** Over 70,000 high-class positions paying $2,500 to $10,000 a year **open** annually in the hotels of the United States. Nearly one and **three-quarter** billions of dollars' worth **of** NEW HOTELS, CLUBS **AND** INSTITUTIONS being built this **year** will need over 200,000 **trained** men and **women.** Hotels start **you at** salaries **up** to $3,500 **a year, with** living **usually** included. **At any** time there **are** over **1,000 hotel** positions open.

Previous Experience Unnecessary

You can have one of these fascinating, big-pay positions. Thru our Simplified Study Plan we give you the valuable knowledge that it has taken some of the most successful hotel men years to obtain. Age is no obstacle—young and old alike have equal chance for success. Past experience absolutely unnecessary. A common school education is all you need.

We train you in your spare time and put you in touch with big opportunities. All of your training under the personal supervision of Clifford Lewis, Managing Consultant for over 225 hotels thruout the United States. Our students employed by leading hotels everywhere.

Send coupon today for Free Book, "*Your Big Opportunity,*" showing how we can train you for one of these splendid positions and explaining our Money-Back Agreement.

FREE BOOK COUPON

LEWIS HOTEL TRAINING SCHOOLS,
Room AT-385, Washington, D. C.

Send me without obligation the Free Book "Your Big Opportunity."

Name.....

Address.....

City..... State.....

If You are Making a Penny Less Than $50 a Week, Send for This FREE BOOK

Get a copy of this 64-page book. Hundreds of other fellows have found the way to success through this book. Mail the coupon for a copy today. See what Radio offers you. Don't envy the man who is pulling down big money. You can learn Radio at home in spare time. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50 to $250 a week?

Here's Big Pay Work That's Almost Romance

Today's big-pay field is Radio. Its rapid growth from a two million dollar industry to over five hundred million dollars in a few years has amazed the world. Many fortunes have been made by this rapid growth—many more will be made in the future. Trained men are needed to carry on the tremendous Radio business that has been created. The work is easy, fascinating, interesting. Salaries range from $50 to $250 a week in the best jobs. Here is a most remarkable opportunity for quick financial independence. "Rich Rewards in Radio" gives you facts and proof.

Easy to Learn Radio at Home

My practical method makes learning easy and interesting. With six big outfits of Radio parts, given without extra charge, you build and experiment with practically every type of receiving set known today—also learn how to locate and remedy common set troubles. In a short time you can be ready for a new job—you'll know the "how" and "why"—you'll have confidence in yourself because you will have worked out just the kind of problems that come up—not with toys, but real Radio parts and sets. This kind of training gives you experience while learning. It shows up too in your pay envelope.

Pay Your Tuition out of Spare Time Earnings

Almost the day you enroll I begin showing you how to make money on the side. Many students earn $15, $20 and even $30 a week in spare time. I'll show you how to get jobs, what to charge, tell you what methods made money for other students—give you tested ideas, hints, tips, pointers. Earle Cummings, 18 Webster Street, Haverhill, Mass., $375 in one month; George Page, 1807 21st Ave. S., Nashville, Tenn., picked up $935 in his spare time while studying.

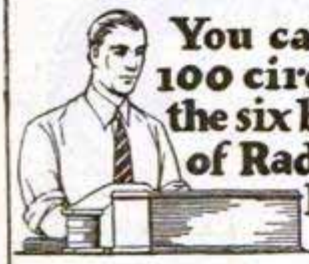
You Must Be Satisfied

I'll give you a written agreement the day you enroll to refund your money if after completion you are not satisfied with the course I give you. You are the only judge. The resources of the N. R. I.—the Oldest and Largest Home Study Radio Training Organization in the world, stand back of this agreement.

Complete Information Sent FREE

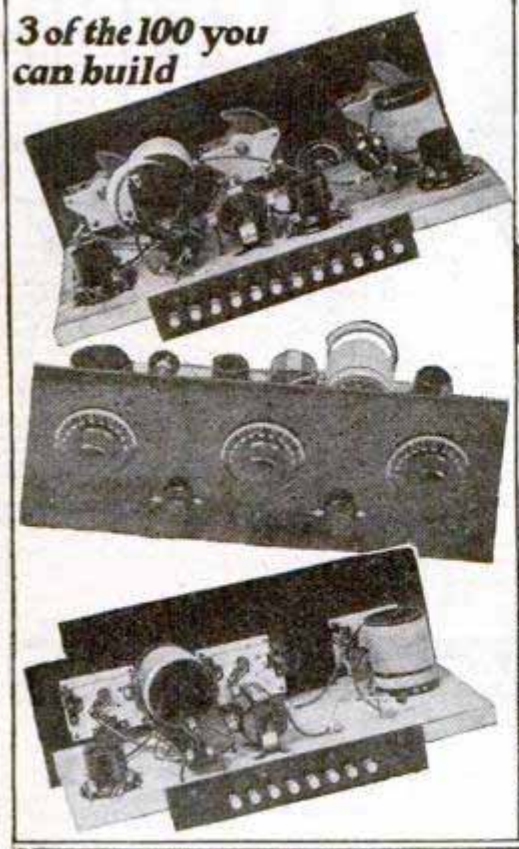
I want to help you become successful. My 64-page book "Rich Rewards In Radio" gives full information on the Radio industry, what it offers you, what salaries are paid, what other men are making, and how my Employment Department helps you get into Radio after you graduate. Send for a copy. I won't charge you a cent. Simply clip or tear out the coupon and mail it. You don't obligate yourself in any way by mailing the coupon.

J. E. SMITH, President
Dept. 4-H
NATIONAL RADIO INSTITUTE
WASHINGTON, D. C.



You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



MAIL THIS NOW

RADIO NEEDS TRAINED MEN!

Read What N.R.I. Training Has done for These Men

High as $78 a Week

"I have made as high as $78 in one week in a retail Radio store. I estimate my total income, as the result of my knowledge of Radio around $3,000. I know I could not have picked a better course." Frank Reese, 304 Walnut Street, Coatesville, Penna.

20 Times Price of Course

"In the last ten months I have earned enough money to pay for my course twenty times. To date I haven't had a complaint on any of my work.
"A short time ago I was in Plattsburg and called on Mr. Stauffer, who is an Institute man. He is doing fine and making lots of money. I want you to use this letter and my picture in any way that it will help you." William E. Riddle, 9 Stevenson Lane, Saranac Lake, New York.

FREE BOOK COUPON

J. E. Smith, President,
Dept. 4-H, National Radio Institute,
Washington, D. C.

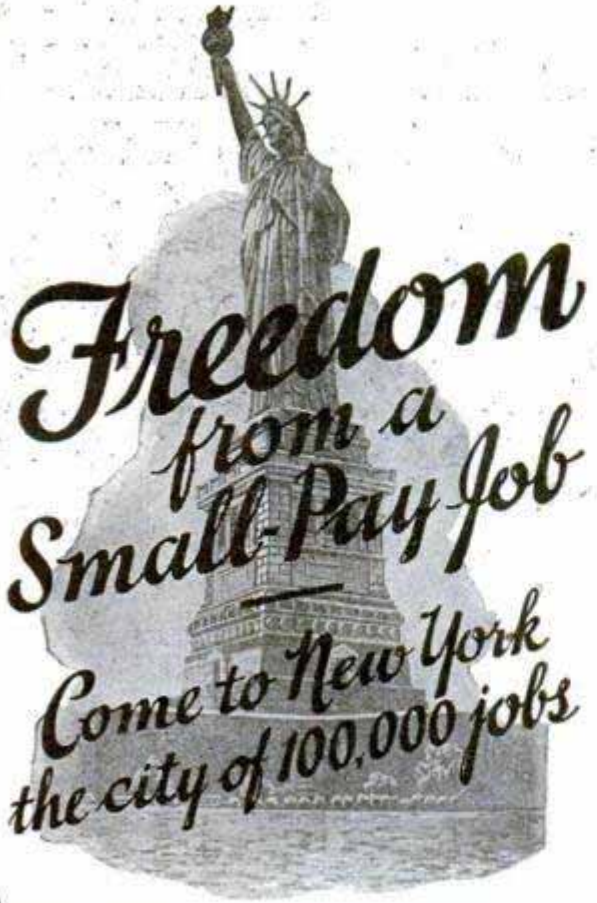
Dear Mr. Smith: Without any obligation on my part, send me "Rich Rewards in Radio" also full facts and information on your practical Home Study Course.

Name.....Age.....

Address.....

City.....State.....

Employment Service to all Graduates



ANY MAN who can read and write and use a pair of pliers can become an electrical expert and free himself forever from the long hours and drudgery of a small pay job.

And you can learn the BIG PAY profession of electricity right in New York City—the heart of the electrical world—the city of 100,000 jobs. At the same time you are learning the BIG PAY profession you can be enjoying the sights and wonders of New York, the modern Bagdad.

Be An Electrical Expert

Graduates of the **NEW YORK ELECTRICAL SCHOOL** are in demand by all the big electrical companies. Or, if you prefer the independence of a business of your own, there are thousands of opportunities for efficient, **dependable** men to become electrical contractors. When you are your own boss the money you can make is limited only by your own energy and ability.

Personal Instruction

The **NEW YORK ELECTRICAL SCHOOL is not** a correspondence school. You learn by doing—by personal instruction on full size standard electrical equipment under the personal supervision of trained instructors.

At N. Y. E. S. you train your hands and mind at the same time. You learn the theories of electricity—and then you are shown how to put the theories into actual practice by solving the problems with **your own hands.**

The man who has learned electricity by actually doing electrical work under intelligent personal instructors can go to any part of the world and be sure of a good living. There are N. Y. E. S. graduates in all the countries of the world.

Write today for the 48-page booklet giving full information about the N. Y. E. S. Course and showing pictures of the equipment available for your personal use in our two seven-story buildings. Mail coupon *now!* **The New York Electrical School, 44 W. 17th Street, New York.**

The New York Electrical School
44 W. 17th Street, New York

Please send me FREE your 48-page booklet. It is understood that this request puts me under no obligation.

Name.....

Address.....

Don't Envy The Plumber
BE ONE!

$11.00-$16.00 PER DAY and work EVERY day, is the Plumber's wage.

Every skilled workman will tell you that Plumbers have the best of it. WINTER and SUMMER the Plumber is busy at top wages. No skilled Plumber is ever out of a job—compare his opportunities with any trade, plus the opportunities of having your own shop.

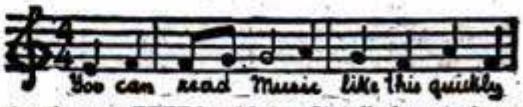
We teach you Plumbing with TOOLS (not books) under Licensed Master PLUMBERS in one of the finest equipped schools in America. We make you a Plumber, every branch is taught thoroughly—Lead Work—Blue Print for plan reading—all other tricks.

LEARN IN 8 to 12 WEEKS without previous experience.

If you are making less than $60.00 a week you owe it to yourself to investigate. Get FREE catalog that tells in pictures and words how we teach this trade. Special rates now.

UNIVERSAL PLUMBING SCHOOL
2030 Troost Ave. **KANSAS CITY, MO.**

MUSIC LESSONS IN YOUR HOME



Write today for our **FREE booklet.** It tells how to learn to play Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc. Beginners or advanced players. Your only expense about 2c per day for music and postage used. **American School of Music**, 51 Manhattan Bldg., Chicago

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BOOKS SENT FREE!

Only fifteen minutes a day with these WONDER BOOKS will prepare you for a good Drafting job in less than a year! Mechanical and Architectural Drafting from simple straight lines to important, complex plans, *a step at a time!* Built especially for beginners, for men with only grammar schooling. Drafting room practice *plus engineering* made easy and clear!

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4 Big Volumes

Written so you can understand every word, by 18 famous Engineers and Architects. DeLuxe, flexible binding. 1750 pages, 1050 blue prints, charts and diagrams. Prepares you for a good Drafting job in mechanical or architectural lines. Sent for 15 days' free use, if you mail coupon immediately.

Big Field—Big Demand—Big Pay!

Competent Draftsmen are urgently needed right now in all building and manufacturing lines at $50 to $100 a week. That's just the beginning—*for draftsmen have the best chances for advancement!* Pleasant, fascinating work, easy to learn and do. Learn quick with these books—send coupon for a set FREE, and see for yourself!

A year's Consulting Membership in the American Technical Society now given free to all readers of this famous Cyclopedia of Drafting. Many say that's worth more than cost of books.

American Technical Society
Dept. D-419, 58th & Drexel Ave., Chicago

Modern American Homes FREE!

American Technical Society
Dept. D-419, 58th & Drexel Ave., Chicago

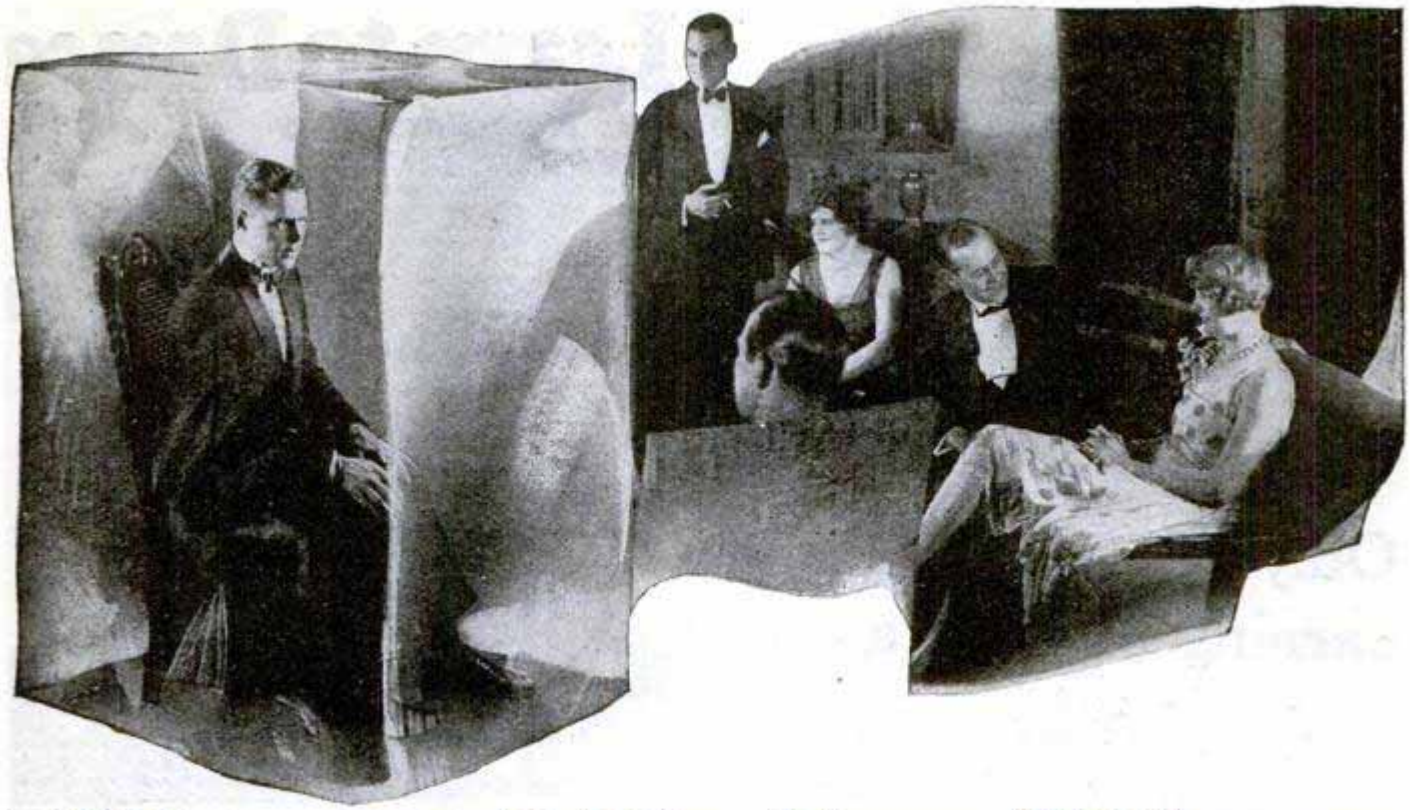
Send for 15 days' free use 4-volume set of *DRAFTING.* In return for mailing this coupon promptly send absolutely FREE "*Modern American Homes*," 112 plates, exteriors, interiors and plans. I will pay the few cents delivery charges. If I wish I may return books in 15 days and owe you nothing. But if I prefer to keep them I will send $1.80 after 15 days, then $2.00 a month until $14.80 (special reduced price) is paid.

Your Name .....

Your Address .....

Reference Name .....

Reference Address .....



I Turned To Ice When I Tried To Talk

—But Now I Can Sway An Audience of Thousands!

I HAD always been painfully bashful. When trying to carry on even the most commonplace conversation my voice would sound unnatural and my hands and knees would tremble. Often I would listen to an argument among a group and become so keenly interested that I would want to voice my own opinion—yet timidity would keep me silent. I never had the courage to stand up for what I knew to be my rights—I was always afraid of "what people would say," ridicule. Since my childhood I had had a secret desire to appear in public—to be active in politics—but my shyness was so great that I turned to ice when I tried to talk—in even the smallest gathering!

My inability to talk was also affecting my business success. I dreaded going in and asking for a raise — I was afraid of any situation that meant using my voice—having to express myself. I didn't know how to present the ideas which I was sure the firm could use. I was just a plodder—a truck horse, capable of doing a lot of heavy work but of no use where brilliant performance was required. Often I would see men who were not half so thorough nor so hard working as I, promoted to positions where they made a brilliant showing — not through hard work, but through their ability to talk cleverly and convincingly—to give the appearance of being efficient and skillful.

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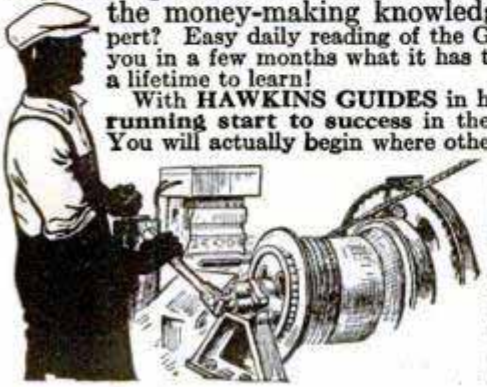

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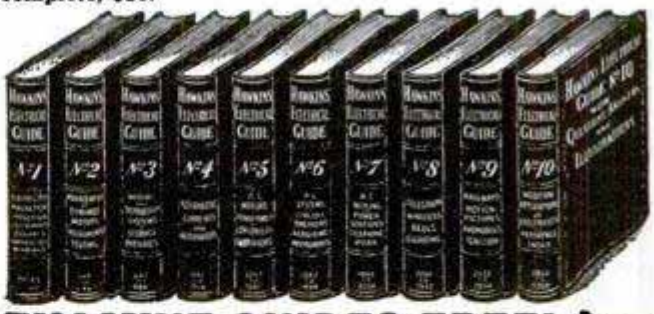

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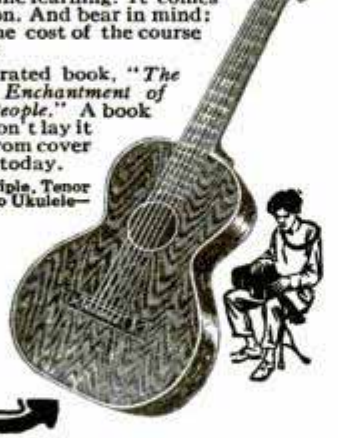

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"You'd better lock the piano!" came the laughing rejoinder.

"Nonsense! He won't have the nerve to play after what happened the last time!"

"That was a shabby trick. I almost wish we hadn't pulled it. . . ."

How well I knew what they were talking about!

At the last party I had attended I had sat down at the piano and in my usual "chop-stick" fashion started playing some popular numbers.

Before long, however, I had noticed an unusual stillness. I stopped playing, turned around, and saw—*the room was empty!*

Instead of entertaining the party, as I had fondly imagined, my halting, stumbling performance had been a nuisance.

Burning with shame and indignation I had determined to turn the tables. At last, tonight, the moment had come.

Every one seemed overjoyed to see me again—obviously glad that I had evidently forgiven and forgotten last year's trick.

Suddenly I turned to Bill and said, "Hope you've had the piano tuned, old boy. I feel just in the mood. . . ."

I Fool My Friends

Instantly the friendly atmosphere changed. It was amusing to see the look that spread from face to face. For a moment no one spoke. Then, just as I was sitting down at the piano, some one called:

"For heaven's sake, get away from that piano! *Don't spoil the party!*"

That was my cue. Instead of replying I struck the first bars of "Sundown." And how! Easily, smoothly, with all the verve and expression I had always longed for!

The guests gasped with amazement. Fascinated, scarcely believing their ears, they drew nearer. When I finished they loudly clamored for more. Time and again, when I would have stopped, they eagerly insisted on "Just one more, please!"

When they finally allowed me to leave the piano I turned around and said:

"Just a moment, folks! I want to thank you for what you did for me last year!"

The eager, laughing faces turned red with embarrassment. One or two of the boys murmured an apology. Seeing their confusion, I continued:

"I mean it! If you hadn't opened my eyes, I'd still be a dub at playing. I went home mighty angry that night, I'll admit. But it taught me a lesson. And believe me, folks, when I think of the real pleasure I get out of playing now, I'm only sorry you didn't pull that trick sooner!"

Before letting me go home that night Bill demanded "*How did you do it?*"

I laughed. "Why, I just took advantage of a new way to learn music, that's all!"

"What! Didn't you take lessons from a teacher?"

"No! *I taught myself!* When that trick showed me up last year, I sent to the U. S. School of Music for one of their free demonstration lessons. Well, it proved to be so much easier than I had hoped for, that I sent for the complete course. And believe me, I'm mighty glad I did! There wasn't any expensive private teacher to pay—and since the lessons came by mail, I didn't have to set aside valuable hours to study. I practiced only in my spare time, a few minutes a day. And the course is thorough! Why, almost before I knew it, I could play *anything*—ballads, rhapsodies, waltzes, jazz!"

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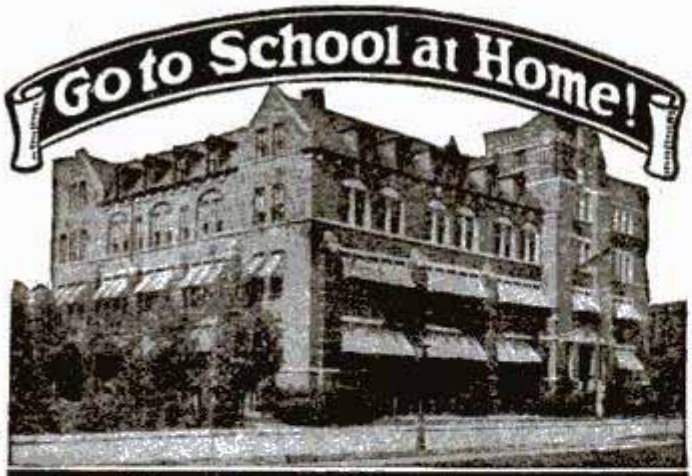

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Imagine an *automatic* machine that opens any can, round, square or oval, simply at the turn of a crank. Cuts the entire top out, slick, smooth and clean! No more stabbing and hacking with old-style can openers. No more fingers cut and infected on jagged tin-can edges. For Speedo holds the can—strips the top out—flips up the lid—all in a couple of seconds! No wonder women simply go wild over it. And no wonder 4 out of 5 buy on a 10-second demonstration!

The "Magic Groove" Sharpener

Women never saw anything even remotely like this other "twin" invention, the Speedo Sharpener. Just demonstrate the "Magic Groove" and watch their eyes pop open with amazement. Now anyone can put a keen, smooth edge on everything that cuts. Even scissors! Every woman sees instantly that here is an end to the drudgery of dull knives and tools. That's why agents report as much as $10 and $12 in a single hour with Speedo sharpener alone!

Generous Co-operation

This company has been in business over 20 years. Speedos are made entirely in our own big factories, under exclusive patents. Each item is backed by a printed guarantee of *5 years' perfect service*. We give you exclusive territory. Over 100% profit! We train you from A to Z, and supply you with a complete selling outfit FREE.

Mail The Coupon TODAY

Any ambitious man with just ordinary common sense can see the possibilities of the proposition at a glance. If you are that kind of a man, I want to send you my FREE OUTFIT and FREE TEST OFFERS. I want to show you what real big money means. Mail the coupon today. Then get set to test the fastest, dizziest profit makers of your life. Write me this minute!

CENTRAL STATES MANUFACTURING CO.

Dept. D-701, 4500 Mary Avenue, St. Louis, Mo.

Sharpens Like Magic

Just rest blade on Magic Groove, turn handle. Sharpens a ten-inch knife in six seconds. Puts a razor edge on everything that cuts.

Grinds Scissors Perfectly

Rest blade against guide, give handle a couple of turns—Presto! Scissors are sharp as new.

Central States Mfg. Co., Dept. D-701,
4500 Mary Ave., St. Louis, Mo.

Rush me details of your proposition and FREE TEST OFFER.

Name.....

Address.....

Town.....State.....

O. C. MILLER
Director Extension Work
American School

3 Drafting

to prove you can

We have invented a new, simplified way to teach Drafting—the first real improvement in Drafting home instruction in history. We want you to see a few of these new Job-lessons, try them, test your own ability to master them—without one penny of cost or obligation. For instance, you will see how we get away from the "copying" methods used in the past, so you develop into a DRAFTSMAN, instead of a "tracer." See for yourself the ingenious new method which compels you to think, to solve problems, to do actual Drafting-room jobs from the very first lesson!

A New, Rapid, Simplified Training

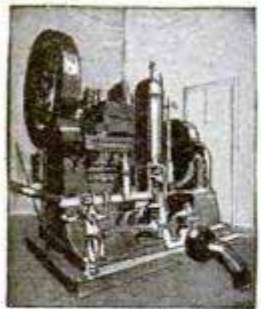
Copying drafting lessons prepares you to be only a "tracer." This new "Job-Method" gives you actual drafting-room jobs in a new one-step-at-a-time way. With pictures which you can understand almost without reading the "lessons." And that is why the American School-trained Draftsmen can qualify for a good job at big pay when they graduate.

Win Success Thru Drafting

Drafting is easy, fascinating work. Short hours. Big pay. And the Draftsman is always in line for promotion to executive positions. This training is *complete*. It includes high school subjects (if you need them) and all the Engineering and Mathematics Drafting experts require.

The American School

A million Dollar *No-Profit* Educational Institution, now offers men a *double* service—training for a specific job, then help in finding the job. For one small price, on terms of only $6.00 a month, you are now assured of definite benefits, both in position and salary. Write for complete information—*today!*



No machine can be built until the Draftsman first builds it on PAPER. My training prepares you for this work.

Never has the world seen anything like the building boom of today. This has created enormous **demand for real Draftsmen.**

5 BIG-PAY Branches

The big money in Drafting goes to men who specialize in Machine Design, or Electrical Drafting, or Architectural Drafting, or Structural, or Automotive. It is not enough merely to know *general* Drafting practice. You must know how to calculate and design and plan original work. You need many Engineering subjects to fill the kind of a Drafting position that pays $60 to $125 a week. The American School *now includes this specialized training in its Drafting course.*

Costly Drafting Outfit Given!

Fine, imported instruments like these help you learn Drafting quickly and easily. These standard quality, full size instruments, board, table, triangles, T square, ink, protractor, etc., given to every student without extra cost.

FREE Job Service!

The American School now offers its students and graduates, without cost, the services of an efficient employment department keeping in constant touch with employers of Draftsmen all over the U. S. We have placed hundreds of men in good, big-pay Drafting positions. We've made this training so complete, so practical, so easy to master, that our students **are bound to make good.** And so, because the demand for real Draftsmen continues to exceed the supply and because this training actually prepares men for good Drafting positions **we back it with a Free Employment Service.**

O. C. Miller, Director Extension Work

The American School

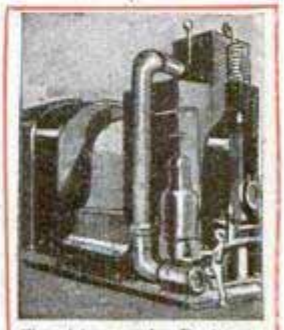
Dept. D-474
Drexel Avenue and 58th St., CHICAGO

Lessons Actually FREE

learn at home in spare time!

Draftsmen Wanted! $60 to $125 a Week!

70,000 fine jobs advertised last year. Get ready to fill one. Get out of the rut. Make something of yourself. Plan your future in Drafting. Even if you have only common schooling, even if you know nothing of Drafting, we guarantee to make you a real Draftsman *or to refund your money!* Special surprise offer right now to the first 500 men who answer this ad—reduced price, easy terms.
Coupon brings complete information.



Electricity needs Draftsmen who know Electrical principles as well as general Drafting practice. I give you this training.

The demand for Draftsmen experienced in concrete and structural steel work is enormous. Many big-pay positions open.

Every great Auto factory employs Draftsmen who specialize in Automotive work — men who design bodies, plan engines, etc.

I Will Make This Contract With You

American School
—the Million Dollar Educational Institution

WHEN you enroll for our home-training in Drafting, we agree to give you:

1. Complete Drafting training, by the new Practice-Method.
2. Professional Drafting Outfit, as illustrated.
3. **We will help you get a good Drafting position** at a substantial increase in pay,
4. or we'll refund every cent of your money.

O. C. Miller
Director Extension Work

Coupon *Brings 3 Lessons* FREE!

Get them. Test your own ability to learn Drafting and get ready for a fine job and big pay. Coupon also brings surprise offer, and complete information about your opportunities for success in Drafting. *Mail It Today!*

Read These Letters!

City of Chicago
Department of Buildings

Gentlemen: The same day I received my diploma I got word that I was one of the two candidates who had successfully passed the examination for Deputy Commissioner of Buildings of the City of Chicago, a position paying $3600 per year.

There were eight applicants examined besides myself, all men well known to the architectural and engineering profession. Seven of these failed to obtain a passing grade of 70%. My grade was 84.69.

Inasmuch as I failed to pass this same examination three years before, my present success is mainly due to the knowledge gained through your School.

Yours very truly,
ROBERT KNIGHT

Got His Draftsman's Job

"I wanted to let you know how I came out in getting that job at the Brownell Co., Dayton, Ohio. I was to start and have a trial at Drawing, and I am still in the Drawing room. The engineer seems to like the work I make, and also the other draftsmen. I thank the school very much for getting me in at this place, because your letter of recommendation helped me a whole lot to get the job."

BERNARD WEBER,
730 St. Nicholas Ave., Dayton, O.

Liberty
High School
Bethlehem, Pa.

Dear Sirs:—This is to thank the American School for all that you have done for me since I signed up for the Drafting and Design Course.

In the eight years since then, I have gradually climbed from the position of tracer to that of Head of the Department of Machine Drawing and Design in our magnificent new $2,000,000 High School here, at many times the salary which I received at that time.

The officials of the Pennsylvania State Department, and Dr. Wm. C. Ash of the University of Pennsylvania, all claim that our Course in Drafting and Design is the best now being taught in this state. Every drafting graduate that we have turned out has proved successful, and one is now Chief Draftsman in a local steel concern. Yours sincerely,

J. S. LEAR

Has Charge of Large Jobs

"Even before I had finished my course, I was put in charge of large construction jobs in different cities. I have been doing that ever since, and the jobs are getting larger all the time. I owe my success to the American School because of the knowledge I gained in mathematics and calculations."

ELMER L. LAMB,
1306 Smith St., Peoria, Ill.

3 Drafting Lessons Actually FREE

O. C. MILLER, Director Extension Work
AMERICAN SCHOOL
Dept. D-474, Drexel Ave. and 58th St., Chicago.

Rush 3 Free Drafting Lessons, Job and Raise Offer, complete information, money-back guarantee, etc., to prove I can become a real Draftsman at home in spare time.

Name.....

Street No.....

City.....State.....

Fly to Success!

The opportunity of the age awaits YOU NOW!

Aviation offers fame, fortune and freedom to men who qualify—quickly!

Do you thrill to the call of the air? Answer it, for NOW is the time! Make history for yourself! The new day has dawned for the greatest of all industries. Millions of dollars are invested. Man power is needed.
This season will see 10,000 new commercial planes in the air. Pilots are required for them, and 17 to 18 important ground positions for every one. The demand many times exceeds the supply. Rich are the rewards to those who answer TODAY.

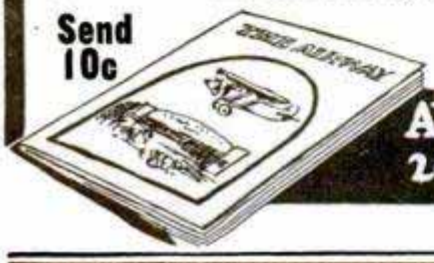
Real Transport Company Training

But every man must be trained in ground mechanics and aviation and be licensed—must pass the government tests.
You can get that necessary **complete** training in the shortest possible **safe** time from the largest responsible company in Chicago actually rendering contract transport service to and from all points radiating from Chicago, with its own modern hangar, shops and school on Chicago's million-dollar airport, using only latest commercial equipment—Ryan-Whirlwind, Laird-Commercial and Swallow planes.
Only U. S. licensed planes, pilots, mechanics and instructors. Famous aces teach you to fly.
Modern planes for post graduate use to build time in air necessary for pilot's licenses furnished on club plan at lowest cost.

Earn While You Learn

Full or spare time training, day or night classes, or home study. Five-year free employment service during and after training. The season is on NOW! Do not delay! Write for full information today!

Send 10c



"The Airway" will show you the way. Send 10c at once for this fascinating book of facts everyone interested in Aviation should read.

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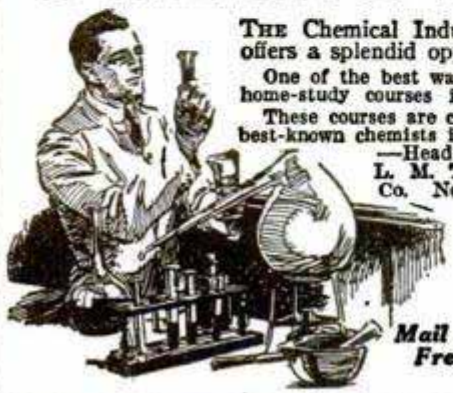
WATSON E. COLEMAN,
REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.
WASHINGTON, D. C.

CHEMISTRY—Learn at home



THE Chemical Industry now ranks fourth among the industries of the United States and it offers a splendid opportunity for ambitious men.

One of the best ways to prepare for a good position in this fascinating field is through the home-study courses in Chemistry offered by the International School of Chemistry.

These courses are complete and practical because they were prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D. —Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D.—Formerly Chief Chemist, Wilson & Co. Now Vice-president, United Chemical and Organic Products Co.; BRADLEY STOUGHTON, B.S. —Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

Mail coupon for Free Booklet

INTERNATIONAL SCHOOL OF CHEMISTRY
Division of the
International Correspondence Schools
Dept. 5524-F, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in CHEMISTRY

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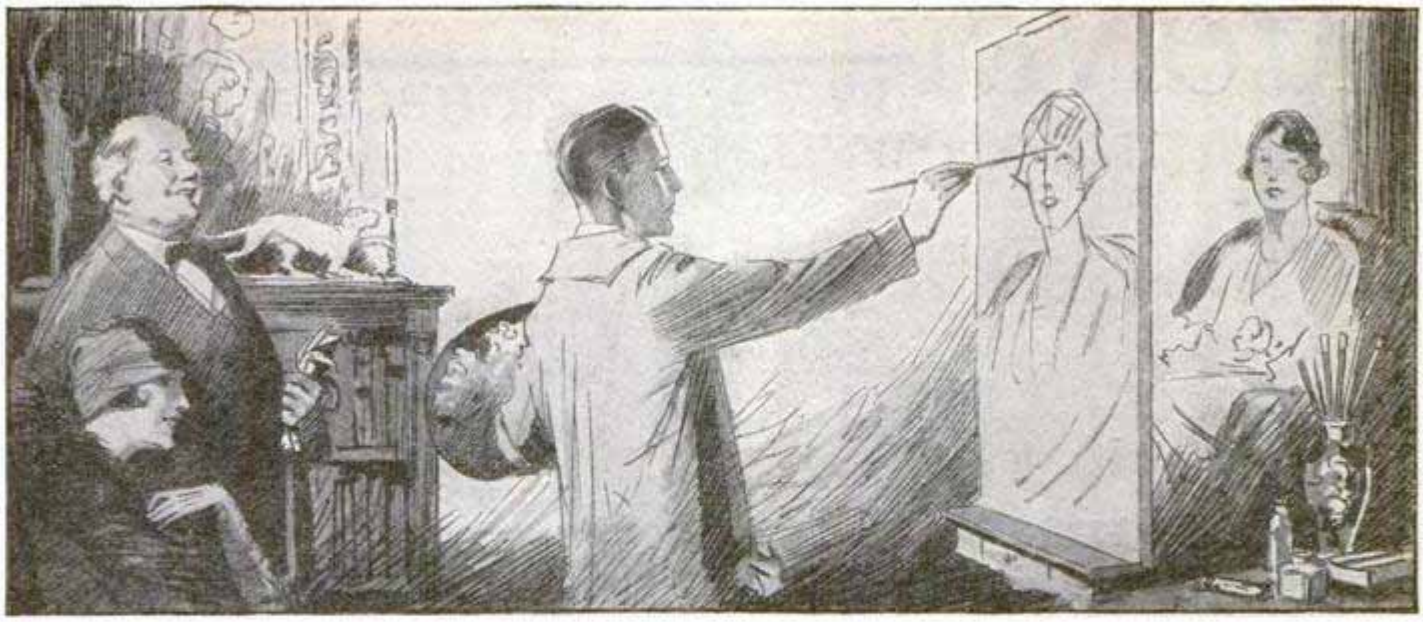
Address.....



Simple Lines Earn Fame and Fortune

"YOU certainly make your money easily," remarked the heavy-set publisher. "My, such speed," interrupted his lady business associate. "How do you get such a true likeness in so few lines?" They had dropped in to purchase illustrations from the young artist whose masterful drawings in magazines and newspapers had started him on the road to fame.

"I never thought it was possible myself," he replied as he added a few telling strokes with his brush. "But I liked to draw. I knew it was fascinating and that it offered opportunities. So I decided to study. Through proper training I have learned to form simple lines into finished illustrations."

It was only a short time ago that this young artist filled out a coupon like the one below and mailed it to the Federal School of Illustrating. "And now," he continued, "each time I make a simple stroke with my brush it means money in my pocket."

This story illustrates the success of hundreds of Federal School graduates. Careful, conscientious training by members of our faculty has put thousands of students on the "Road to Bigger Things."

Over fifty famous artists have contributed lessons and drawings exclusively to the Federal Course of Illustrating. You are undoubtedly acquainted with the work of many of these masters. A few of their pictures appear on this page. They teach you their "tricks of the trade" about illustrating, cartooning, lettering, poster designing, window card illustrating, etc. Every subject is covered thoroughly. No one is competent to give instructions in all these branches. For this reason each subject in the course is covered by a famous artist who has made a success in his particular field. You profit by their experience. Their instructions prepare you for any problem or emergency that may arise.

A Few Famous Federal Authors

SIDNEY SMITH

HERB JOHNSON

CLARE BRIGGS

NORM ROCKWELL

FONTAINE FOX

BART

NEYSA McMEIN

FAY KING

CHARLES L. BULL

FRANK KING

CHAS. M. RUSSELL

W. J. WILWERDING

If you like to draw, why plod along at some tedious work? Opportunities for artists have never been better. Thousands are wanted every year by magazines and newspapers that spend millions of dollars for illustrations. Drawing is easy to learn the "Federal Way." Study at home in your spare time. Earn while you learn, if you wish. Many students find a market for their work after a comparatively short time of study. Others earn the price of the course several times before they finish.

Every mail brings news of the success of students. Charles Phil Hexom of Decorah, Iowa, writes, "My cover work brings from $50.00 to $150.00 per painting." A letter from Sam Nash reads, "I sometimes make as high as $30.00 a day doing bulletins and have averaged $150.00 a month outside of school hours." These are only two typical examples of the success that hundreds of young people are enjoying because of Federal training.

If you like to draw, opportunity lies no further away than the lower corner of this page. Write your name and address on the coupon and get our free book, "A Road to Bigger Things," which is illustrated below. With this book we will send our free Vocational Art Test to find out your ability. Hundreds of successful artists got their start by sending for these. This is your opportunity—grasp it. Mail the coupon now.

Federal School of Illustrating

FEDERAL SCHOOL OF ILLUSTRATING,
4148 Federal School Bldg., Minneapolis, Minn.

Gentlemen: Please send your free book, "A Road to Bigger Things," together with Vocational Art Test.

Name.....Age.....

Occupation.....

Address.....

.....

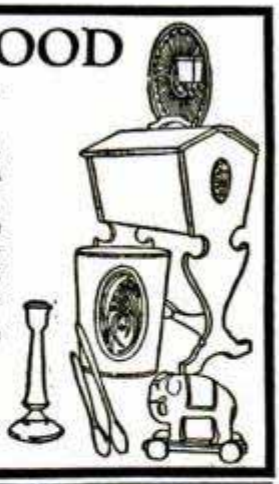
MONEY IN YOUR NEIGHBORHOOD

Here's a Wonderful Way to Get It

Our beautifully illustrated book tells how. It tells all about our new methods of art decoration, art treatment and how anybody can learn without previous training or experience. It contains page after page of handsome color illustrations of what you can make and sell. You can make good money and this book is free. Our system is amazingly easy to learn and the profits are larger than in almost any other business. You can produce beautiful finished art objects almost from the beginning. You don't have to know how to draw or have any experience. Begin making money now.

All supplies are sent by us with the instructions and many have made $25 the first week. Some men and women have taken up this work for their own amusement.—Either way, pleasure or profit, it's the most delightful home work you can imagine. Write Now for your copy of this valuable book; it's FREE.

FREE



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Send for FREE copy of the 30th ANNIVERSARY EDITION of our book, "Winning Independence". Read how students master tuning with our TUNE-A-PHONE, and WHY our graduates head the profession in all parts of the world. With Bryant's patented devices, tools, charts and lessons, one learns quickly and easily. Low tuition; easy terms. Diploma granted. MONEY-BACK if not satisfied. $10.00 to $25.00 a day, exceptional opportunities and an ideal profession awaits you.

BRYANT SCHOOL OF TUNING, 31 Bryant Bldg., Augusta, Michigan.

LEARN TO Mount Birds

We teach you **At Home by Mail** to mount *Birds, Animals, Heads, Tan Furs and Make Rugs.* Be a taxidermy artist. Easily, quickly learned by men, women and boys. Tremendously interesting and fascinating. Decorate home and den with beautiful art. *Make Big Profits from Spare Time Selling Specimens and Mounting for Others.*

Free Book— Yes absolutely **Free**—beautiful book telling all about how to learn taxidermy. Send **Today.** You will be delighted. **Don't Delay!**

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NOW-Boys earn Men's Wages

$75.00 to $125.00 Weekly, Paid to AUTO MECHANICS

Why go on begging for a raise? Why growl and complain because you don't get it? Why, when every city, town and farming community is pleading for more auto and tractor mechanics—trained as McSweeny students are trained, to know cars of every make and to know them "inside out"? Every month my men are taking fine jobs formerly filled by half-trained students or half-baked, self-trained mechanical tinkerers.

I Train You in 8 Weeks Think of it! Working with real tools on real equipment you become in only EIGHT WEEKS a better auto mechanic than men who have "fiddled" around an ordinary garage for years trying to learn. Let me send you the proof, letters from former McSweeny students now earning up to $10,000 a year. *"Mac's SHOP WAY Means Bigger Pay."*

"Mac"

J. H. McSWEENY, Pres.

Your Money Back Guaranteed

If, when you have finished your training, you are not perfectly satisfied; if you are not qualified to fill a big pay job, I will refund every cent of your tuition. There is a reason for my making such a convincing offer. Ask yourself why. Then write quick for my remarkable SPECIAL TUITION OFFER. Save one-third now. See what you get:

Special OFFER

Your Board for 8 Weeks and Your Railroad Fare

For a limited time only, and when you enroll, I will pay your railroad fare to Cincinnati or Cleveland and give you your board for 8 weeks. Send the coupon NOW—before it is too late—for full particulars of this amazing offer. Don't delay.

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Please send your Special Offer and Big Illustrated Book.

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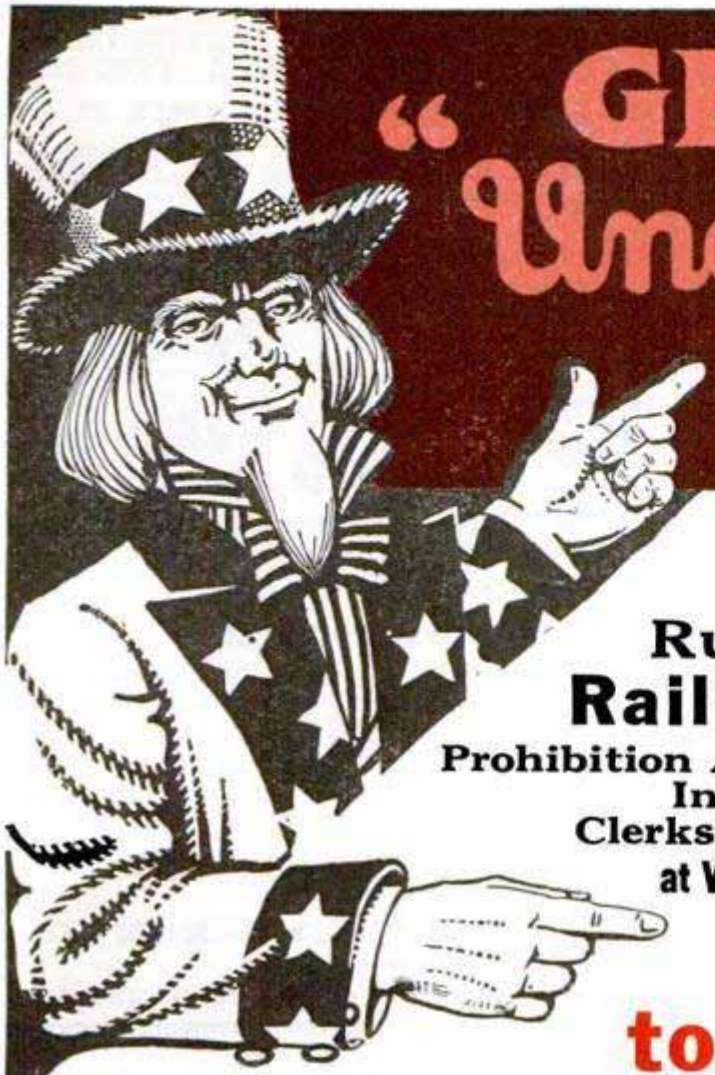
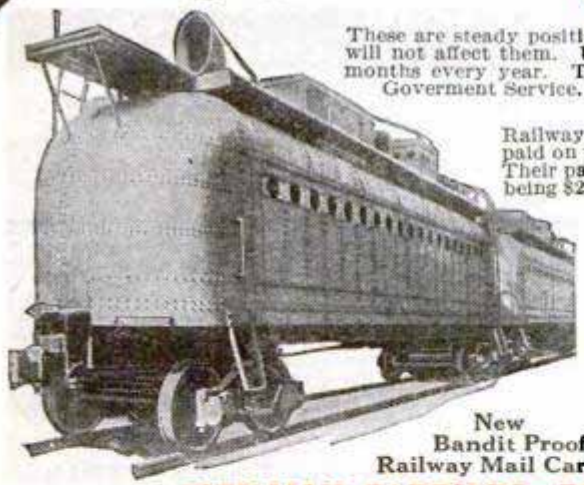


"GET ON Uncle Sam's PAYROLL"

Post Office Clerks
City Mail Carriers
Rural Mail Carriers
Railway Postal Clerks
Prohibition Agents **Stenographers**
Income Tax Auditors
Clerks in Government Offices
at WASHINGTON, D. C., and ELSEWHERE

$1140.00 to $3300.00 a year

These are steady positions. Strikes, poor business conditions, lockouts or politics will not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "HARD TIMES" in the U. S. Goverment Service.



New Bandit Proof Railway Mail Car

RAILWAY POSTAL CLERKS

Railway Postal Clerks now get $1900 the first year regular, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is quickly increased, $100 and $150 a year, the maximum being $2700 a year. $112.50 each payday. They get extra allowance for hotel expenses when away from home.

PAID VACATIONS

Railway Postal Clerks, like all Government employees, have a yearly vacation of 15 working days (about 18 days). On runs they usually work three days and have three days off duty, or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country.

CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers get $1700 the first year regular, and automatically increase $100 a year to $2100 with further increase to $2300. They also have 15 days vacation. Examinations are frequently held. City residence is unnecessary.

GENERAL CLERK

(Open to men or women 18 or over)

Salary $1140 to $1860 a year. Pleasant clerical work in the various departments and offices at Washington, D. C., and elsewhere throughout the country.

WHAT WILL YOU EARN 5 YEARS FROM NOW?

Compare these conditions with your present or prospective condition, perhaps changing positions frequently, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU EARN $1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2700 OR MORE A YEAR, EVERY YEAR?

GET FREE LIST OF POSITIONS

Fill out the coupon. Tear it off and mail it today —now, at once. DO IT NOW—This investment of two cents for a postage stamp may result in you getting a U. S. Government Job.

MAIL COUPON TODAY

FRANKLIN INSTITUTE
Dept. B-173
ROCHESTER, N. Y.

(Not connected with U. S. Government)

Rush to me, entirely free of charge (1) a full description of the position checked below and sample coaching lessons; (2) Send particulars telling how to get appointment: (3) Free copy of 32-page illustrated book, "U. S. Government Positions and How to Get Them," with list of positions now obtainable.

- Railway Postal Clerk..... ($1900-$2700)
- Post Office Clerk..... ($1700-$2300)
- City Mail Carrier..... ($1700-$2100)
- Rural Mail Carrier..... ($2100-$3300)
- Clerk in Government Offices..... ($1140-$1860)
- Prohibition Investigator..... ($1800-$3000)

Name.....

Address.....

Use This Coupon Before You Mislay It — Write or Print Plainly.

GENUINE CORONA

Limited Offer

$2.00 DOWN BALANCE EASY TERMS

HERE'S your chance to secure that Corona you've wanted —on the easiest terms ever offered —at ONE-THIRD OFF regular price! Complete in every detail; two color ribbon, back spacer, beautifully re-newed, NEW MACHINE GUARANTEE. Recognized the world over as the finest, strongest, sturdiest portable built. Only a limited number of these splendid machines available. To get one, you must act now!

Yours For 10 Days FREE Send No Money

Experience the joy this personal writing portable typewriter can give you! Use it 10 days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office desk, home, travelling. Small, compact, light, convenient. Don't send out letters, reports, bills in poor handwriting when you can have this Corona at such a low price or on such easy terms.

Carrying Case Included —If You Act Now

Leatheroid carrying case, oiler, instructions free on this offer. Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only $2—then $3 a month until our special price of $36.25 is paid (cash price, $33.10). Now is the time to buy. This offer may never be repeated. Mail coupon now.

$16 SAVED by using this coupon

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844-360 E. Grand Ave., Chicago.

Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep machine, I'll send you $3 a month until the $34.25 balance of $36.25 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent, who will return my $2. You are to give your standard guarantee.

Name.....

Address.....

Employed by.....

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EAGLE ROCK PLANES

NEWEST, BEST, SAFEST

Transport pilots instruct you. Solo course and thorough ground mechanics. Repair and build planes, repair wings, motor work and trouble shooting.

TRIAL TRIP FREE

Go up with our pilot—see our facilities before signing up anywhere. Test yourself in the air. No obligation.

QUALIFIES FOR LICENSE

50 hour course qualifies you for limited COMMERCIAL LICENSE from Dept. of Commerce. Cross country flying by map and compass. LOW TUITION.

FREE. Send name today for full details regarding nationally known Richards field, pictures of planes, instruction methods, and free card entitling you to airplane ride.

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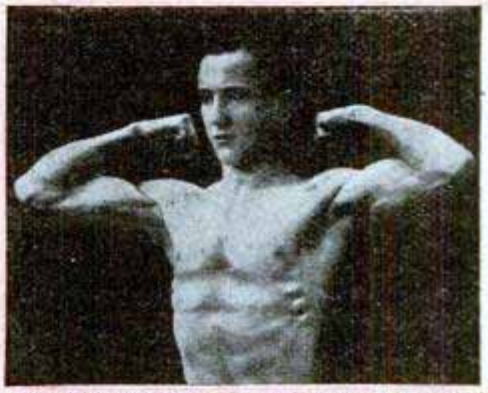
BEFORE: This boy looks pretty hopeless; doesn't he? I'll bet he hated to step out on the beach in a bathing suit, and he had to stand a lot of bullying from the other boys in the gang.

ONE—TWO—THREE! Just like that the boy you see at the right changed from a puny weakling into a physical GIANT! Looks like magic, doesn't it? But it isn't. It's just an example of what Titus Training has done for thousands upon thousands of men.

I've taken fellows of every size and condition and transformed them almost overnight into perfect specimens of manhood! I've been doing it for years. "Miracles worked in Muscle" people call them. But they are ***scientific*** miracles, because I've made a science of building men. Nobody else knows the secret of my methods—but *I* know, and I know they'll do the same for you as they did for the lad shown here.



IN 30 DAYS Pipe This! Here's a real man! Just look at the way those muscles have developed in 30 days of Titus Training. That's going some, isn't it?

In 30 Days I'll Increase Your Muscles by INCHES

Yes sir, that's all I want—30 days—and just 20 or 30 minutes a day. In that short time I'll put layer after layer of muscle all over your body till they stand out like iron bands. And they'll be panther muscles, friend—muscles as live as spring steel—with the speed of lightning and the power of a battering ram. Those are the kind of muscles that make champions, the kind of muscles that will make you laugh at men twice your size.

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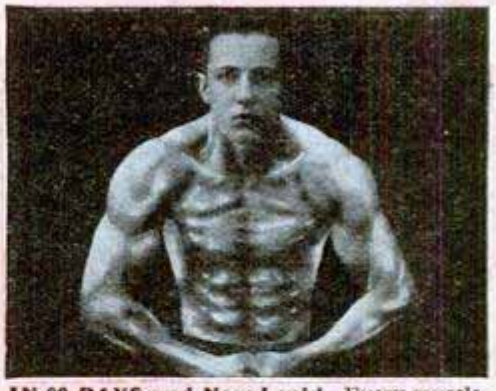
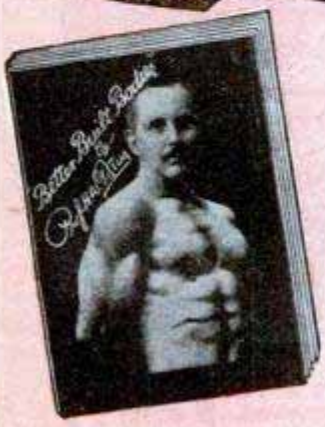


IN 60 DAYS and Now Look! Every muscle in his body developed to giant size. You'd never recognize him as the same lad. Need I urge YOU to mail the coupon?

Mail this Coupon TO-NIGHT!



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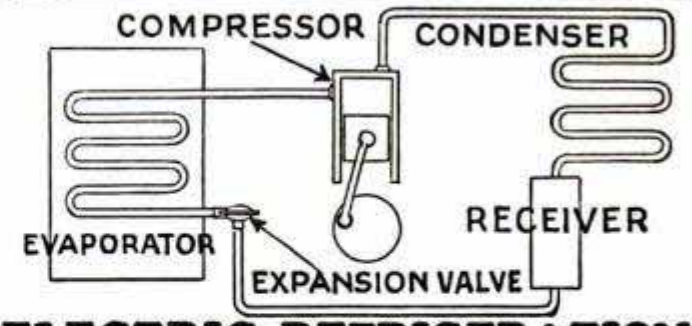

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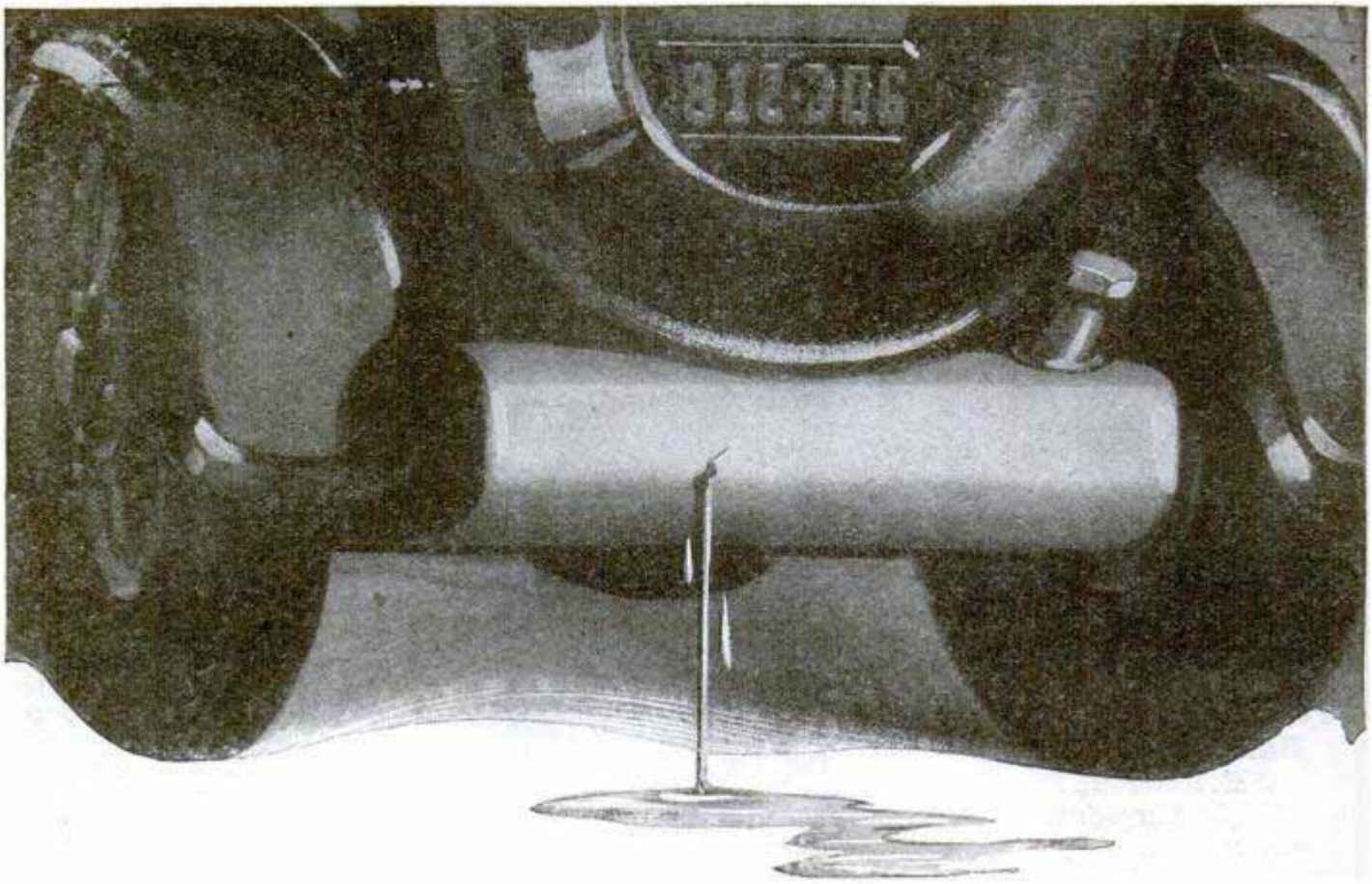

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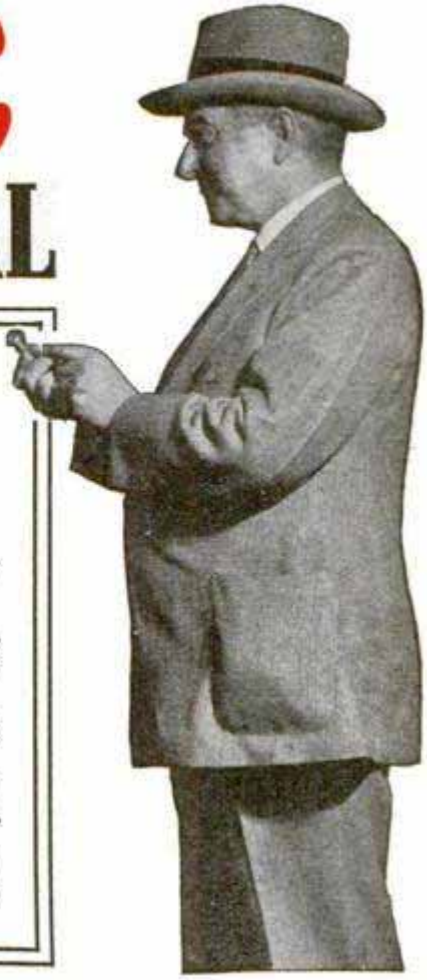

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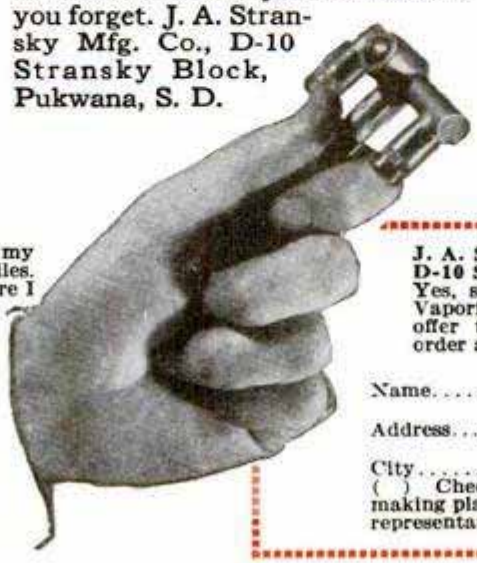

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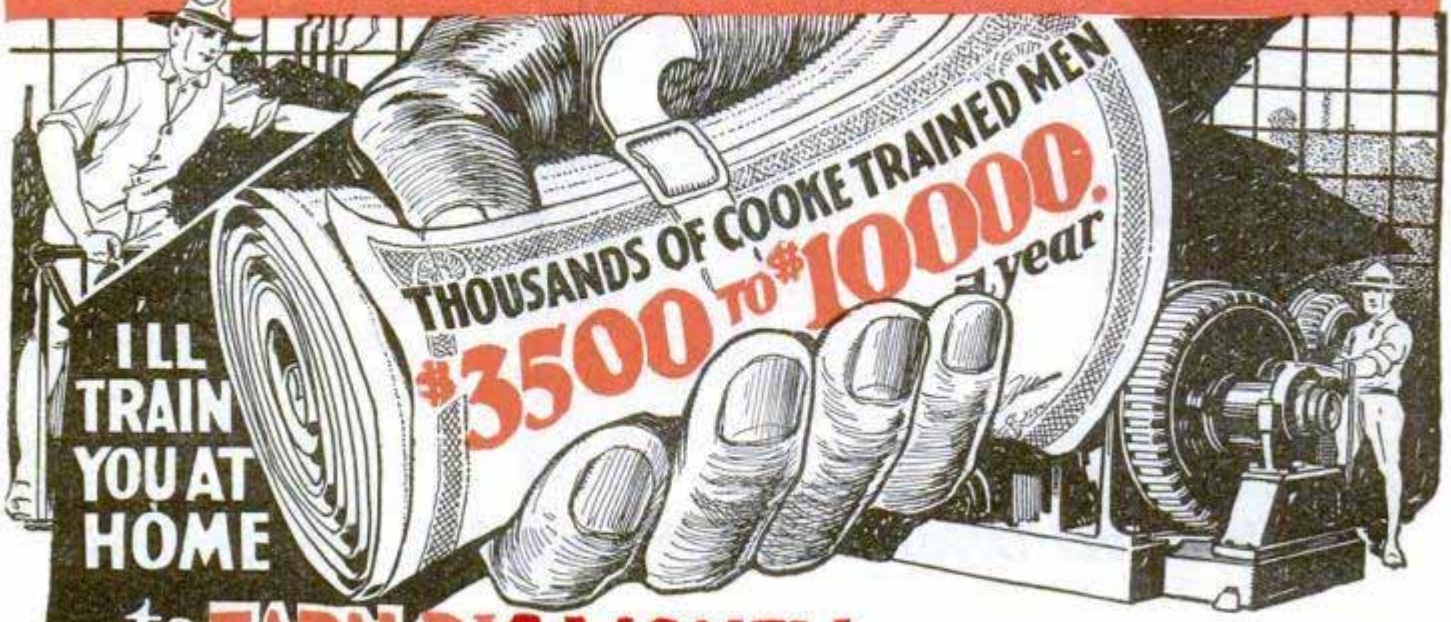

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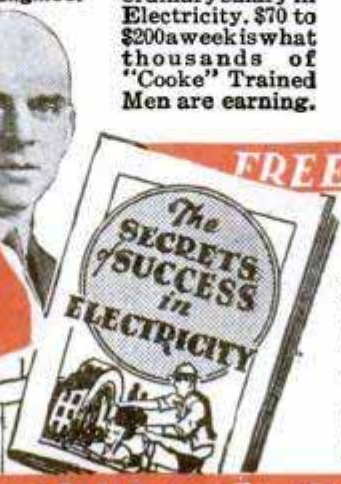

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ATTRACTIVE Lodge emblems for autos. Embossed, engraved, never tarnish. 100% profit. Belle Mfg., 96 Friendship, Providence, R. I.

AGENTS To sell rebuilt watches. Solicit watch repairs. International, Box 5P, Fordham Station, New York.

AMAZING New Glass Cleaner offers you $15 a day sure! "Jiffy" cleans windows, windshields, show cases, etc., without water, soap or chamois. No muss. Easily demonstrated. Housewives, motorists, garages, stores, institutions buy on sight. Tremendous profits being made with "Jiffy" and our 350 other fast-selling Household Necessities. Write for Special Introductory Offer. American Products Co., 1724 Monmouth, Cincinnati, O.

$31.00 PROFIT—with $1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No Experience. No License. "Samples Free." NuLife Monograms, Hartford, Conn.

$12 DAILY Showing New Waterless Cooker. Just write orders. We deliver and collect. Pay daily. Write quick for sample cooker offer. "Besco," 4317NW Irving Park, Chicago.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 32.

ONCE in a Blue Moon comes a chance like this. Pick up $5.40 for a few minutes' work. Then, if you like, become regular representative making $10.00-$15.00 daily. Big established company. Big line. Big business. Write quick. Pitkin Laboratories, 156 Pitkin Bldg., Newark, N. Y.

EARN $48.00 A week and expenses introducing our soap and washing powder. Auto given to producers. Buss-Beach Company, Dept. A42, Chippewa Falls, Wis.

WOMEN—$2 Hourly spare time; 100% commission; new idea; sanitary necessity; sells on sight; every woman buys; new feature never before used; designed by physician; revolutionizes old uncomfortable methods; pay daily; no deliveries, collections, experience or capital required. P. Coleman, Meriden, Conn.

SELL Fence Repair Tool, for taking up slack, and splicing wire while tensioned. Write Hawbaker Co., Elmore, Minn.

$60-$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

ONE of the biggest mails on earth. Sent to any address for 10c. Louisiana Distributing Service, Dept. PM, Harmon, La.

"MYSTIC" Polishing cloth. Fast seller! Free sample. "Mystic" Co., 1260 California St., San Francisco.

AGENTS, $240 month. Dri-Klean-it makes any car look like new. Removes mud, grease, tar, road oil all in one operation. No soap or water used. Cleans any car for 10c. Wonderful seller. Exclusive territory. Big opportunity to make $5,000 a year. Write quick for particulars and free sample. American Accessories Co., Desk 2431, Cincinnati, Ohio.

GOLD-LEAF Window letters and script signs. No experience; 500% profit. Samples free. Meyer writes 5 days profits $141.36. Consolidated, 69-U West Van Buren, Chicago.

AGENTS, New invention! Quickedge Sharpener. Just out. Patented. Big winner. Sharpens any knife or shears in less than minute. Guaranteed. Biggest seller we ever offered. Big profits. No competition. Write quick for particulars. Quickedge Sharpener Co., Dept. 48, Canton, Ohio.

AGENTS: Patented gas range safety device, best gas range improvement; nothing like it on the market in years; over twelve million prospects; sells on sight; 100% profit. Demonstrator $1.00. Rolland & Neubarth, 202 Barton Street, Flint, Mich.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds and deceives. Beautiful case free, $100 weekly. Rajah Diamond Company, F20, Salisbury, N. C.

MEDALLION Agents—Everybody is a prospect for photo medallions, jewelry, compacts, mirrors, photo novelties, etc. Make bigger profits; full time or sideline. Write at once for catalog and plans. Medallion Novelty Co., 208 Bowery, New York, Dept. P.

IMPORT Your Own Goods. German Export Magazine published in English offers numerous bargains latest novelties; opportunities for obtaining profitable Agencies. Copy 60c. Square Deal Supply, P-246 Fifth Ave., New York.

NEW Invention—400% profit. Liquid quick mend for Fabrics and Hosiery. Stops runs. Every woman buys. Hundred other fast sellers. J. E. Johnson Co., Dept. 464, 6129 Wentworth Ave., Chicago.

MIRRORS Resilvered at Home. Costs Less 5 cents per square foot; you charge 75 cents. Immense profits plating autoparts, reflectors, tableware, stoves. Refinishing metalware, etc. Outfits furnished. Details Free. Write Sprinkle, Plater, 128, Marion, Ind.

AGENTS Become a regular established McConnon dealer: buy on credit; sell for cash or credit. 228 absolute household necessities; all repeaters. Enjoy a sure income 52 weeks per year, year after year. City or country trade. Capital, experience unnecessary. McConnon & Co., Dept. S63, Winona, Minn.

$100.00 WEEKLY! Two Suits or Suit and Topcoat $33.50. Wool materials—made to measure. Commission $6.00-$8.00. Outfit Free. Garfield Tailors, A1557 Milwaukee Ave., Chicago.

NO Strings To This Offer! Two actual mops loaned you Free. Make $10 daily showing housewives new Self-wringing Mop and Dust Mop. No money required. You're paid daily. We deliver. Get $5.00 outfit immediately. Delphos Mop Co., 1014B Washington, Delphos, Ohio.

SELL Necessities. 60% commission. Outfit Free. Prof. Nichols, Box 3B, Naperville, Ill.

SELL Feminaid Wonder Products. Big Profits. Quick Sales. Latest line Rubber Goods, Aprons, Stepins, Shadow Skirts, Baby Comforts, Household Necessities. You cannot fail. American Rubber Products, Dept. 372, Pittsburgh, Pa.

WRITE For New Low Prices, direct from manufacturer, Flashy Felt Rugs. Attractive colors and patterns. Popular size $13.50 dozen. Sample Rug $1.40. Newark Felt Rug Co., 416-F Morris Ave., Newark, N. J.

AGENTS—Mosco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Co., 403 Searle Bldg., Rochester, N. Y.

NEW Discovery! Whirlwind seller! Free sample! American Co., 1260 California St., San Francisco.

SELL Printing, spare time. Commission. Samples ten cents. Excel Press, 774 Boulevard, Bayonne, New Jersey.

FAST Selling article; costs 10c; sells for $1. Repeat orders. Sample 25c, none free. Louis Marmorstein, 380 Jackson, Jersey City.

STOP: 300 Fast-selling specialties from many parts of world. Proposition hard to beat. Write for Free Wholesale catalog. Spors Co., Lesueur Center, Minn.

WHY Work for others? Every home a prospect. Dollar for sample refunded with first order. Write today. See ad under heading "Books." Chas. Geiser.

AMERICA'S Finest Hand-Tailored Line. Made in Milwaukee. Retails $31.50 to $40.00. Earn $6.00 to $10.00 each sale. All wool. Satisfaction Guaranteed. Large Selling kit. Call or write. Joseph Goodman & Sons, 373 E. Water St., Milwaukee, Wis.

MEN—Women, $1.80 an hour. No less. Large Mfg. Co., established 30 years. Starting new medallion dept. Amazing new sales plan. First 22 agents average $1.80 an hour steady. Only 1 agent wanted in locality. Your Own Photo Free as sample. Art Medallion Co., Dept. 73, Corner Campbell and Jackson, Chicago, Ill.

SELL Beautiful "Style Tailored" shirts and neckties direct to wearer at factory prices! Many beginners earn $50 first week in spare time. $100 weekly full time easy. Selling outfit Free. Howard Shirts, 1213 Van Buren, Section 14, Chicago.

BIG Season open. Brand new specialty—sell dealers—homes. 100% profit. Every call a sale. Territories going fast—reserve yours now. Particulars free. Garden Shears Co., 1148 Lake St., Chicago.

ORDER A sample $7.00 Men's Oversize Green Nonbreakable fountain pen today. C. O. D. to agents at $2.25. Sells at $4.00. Has 14 Karat solid gold pen tipped with hard Iridium. Five year guarantee. Sales plans free. J. E. McCabe, Sales Manager, Dept. PM, 316 Lincoln Ave., Rockford, Ill.

AGENTS—100% Profit demonstrating non-corrosive polish for metals and wood. One application will last for months. Cebek Sales Co., 3123 W. 22nd St., Chicago, Ill.

WONDER Wrinkle Remover. Quickly Demonstrated. Visible results. Enormous profits. Formula with label copy, $3.00. Get it first. Associated Chemists, Indianapolis, Ind.

BRING Home the Bacon! Selling Christy's Polishing Cloth. Polishes all metals in a jiffy. Easy to demonstrate. Everybody buys. Unusually handsome profit. Write for free sample. Christy, Inc., 5767 B'way, Newark, New York.

AGENTS: Liberal commissions and bonuses selling high quality hosiery, handkerchiefs, scarfs, men's ties, curtains, bedspreads, linens. Also a big line of dress goods, silks, etc. 1,000 samples furnished. Write quickly. The National Importing Co., 573 Broadway, Dept. D-100B, New York, N. Y.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS, $13 daily in advance. Bonus besides. Introduce finest line guaranteed hosiery you ever saw. 126 styles, colors. Spare time satisfactory. No experience needed. Credit given. Samples furnished. Wilknit Hosiery Co., Dept. 4431, Greenfield, Ohio.

AGENTS—Big Money! Sell dress goods. Wholesale prices. Highest commissions. Bonus. Full—spare time. North American Importing Co., 1123 Broadway, Dept. A3, New York.

COMMON Sense Selects the new B & G Line to make the Dollars. Three staple lines combined, Rubber Specialties, Undergarments, and Sanitary Goods combined to make money-making a simple problem. Write B & G Mfg. Company, Dept. 347, Pittsburgh, Pa.

MAKE 100 weather Hygrometers for 10c; sell them for 10c to 25c each; formula 50c; sample Hygrometer 25c. G. Villard, 605 Scio St., Rochester, N. Y.

EARN $10 daily silvering mirrors, plating, refinishing metalware, chandeliers, headlights, bedsteads. E. Decie Laboratories, 225 Varick St., New York.

MEN! 3 Easy sales a day pays $90 a week. Just show samples and photos: Biggest value ever offered. 2 Perfect, Fine Quality Suits, Suit and Topcoat $29.50. Collect and keep $5 deposit. Every sale repeats. Write for Free outfit. James Carroll Inc., 565 Broadway, New York.

AGENTS: Big commissions and bonuses taking orders for our big line of fashionable Dress Fabrics, Handkerchiefs, quality Hosiery, fancy Scarfs, Linens, etc. 1,000 Samples furnished. The National Importing Co., Dept. D-100A, 573 Broadway, New York, N. Y.

SEND For Free Sample of "Ride Airs" and I'll tell you how $20.00 profit a day will be easy for you. No selling experience necessary. I'll prove that! If you are a hustler write me today. Hamilton, Desk C-4, 532 W. 27th, Los Angeles, Calif.

AGENTS, $240 Month. Sell silk hosiery guaranteed 7 months. Samples furnished. Free silk hosiery for your own use. Write today, state size of hose worn. Betterknit Textile Co., Silk 2231, Greenfield, Ohio.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS—We start you in business and help you succeed. No capital or experience needed. Spare or full time. You can earn $50-$100 weekly. Write Madison Company, 566 Broadway, New York.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

NO difference what you're selling, you can increase your sales 500% by giving our $1000 policies as free premiums. Costs you nothing. Name your line and write. United States General Underwriter, B501, Willow Hill, Ill.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine: 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-38, 500 No. Dearborn, Chicago.

SELL men's neckwear; wonderful proposition. Astor, 318-M Broadway, New York.

PREPARED Shoe-Shining Mit. Just Invented. (No Polish Required.) Treated Felt Side Cleans, Polishes. Prepared Side Preserves, Waterproofs. Retails (25c)—Costs (8c). Customers Advertisement if desired. (Sample 15c.) NuLife Shine, Hartford, Conn.

AGENTS Wanted to sell Men's Hats direct from factory. Write for catalog. Model Hat Mfg. Co., Dept M-14, East Orange, N. J.

AGENTS—Sell stores 5c candy Specialties. Lorrac Products, Albany, N. Y.

$16 A DAY Easy—I start you in auto accessory business; no investment; no experience necessary. Landin, 4206 Montrose Ave., Chicago.

$10 DAILY. New, highly practical, useful 50c article for every home and office. Sells on sight. Hydrawlik Corp., Roselle, N. J.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

MONOGRAM Automobiles, $1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

WE sell the improved Roco circulating pump, also Strainer Check Valve. Agents wanted. C. A. Smith Co., 100 Central St., Milford, Mass.

NOCK-O New kind of aluminum cleaner brings profit. A real money maker, $50.00 a week spare time. Nock-O works quicker and better, endorsed by the largest manufacturer of aluminum in America. Combines a cleaner and a polish, removes all stains and discolorations. We will mail postpaid to agents, a full sized container upon receipt of $.25, together with selling plans. Nock Chemical Laboratory, 8th and Sarah Sts., Dept. C, S. S., Pittsburgh, Pa.

SIGN Men and Agents, Attention; new line, genuine gold foil letters. Samples free. Illinois Gold Leaf Letter Co., 123 South Jefferson Street, Chicago, Ill.

AGENTS—Engraved name plates, signs, numbers, etc., easily sold, profits large. Brett Bros., Roxbury Crossing, Boston, Mass.

AGENTS Send for free sample "Fretnot." Washes clothes snow white without rubbing. $5.00 daily and more easily made. Credit given. Empire, 1549 N. Wells, Dept. 101, Chicago.

INSTANT Weld Welds Rubber Instantly. Stock's Profit One Day $72.25. Enormous demand. Exclusive territory. Free sample. Tourists Pride Manufacturing Co., Desk G, Minneapolis, Minn.

AGENTS And Mail Dealers cleaning up with Lanowa Combination. 200% profit. Everything furnished. Write quick for sample. Fraser Products, 212-J Westport, Kansas City, Mo.

CALIFORNIA Perfumed beads selling like hot cakes. Agents coining money. Big profits. Catalog Free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

NO Dull Times Selling Food. People must eat. Federal distributors make big money; $3,000 yearly and up. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with sample case, license and Free Samples for customers—Sure repeat orders. Exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

AUTO owner tire agent wanted each locality to use and take orders for hand made Mellinger cord and balloon tires; guarantee bond 15,000 miles; shipped prepaid on approval; get your tires free; no capital or experience required; make $100 to $300 weekly. Write for wholesale prices and sample kit. Address Mellinger Tire Co., Dept. 400, Kansas City, Mo., or Dept. 400, Philadelphia, Pa., or Dept. 400, Oakland, Calif.

REAL Whirlwind Seller—Nopulout Custom Shirt. Every man buys them. Patented—no competition. Liberal commission. Free selling kit. Make $15 up daily taking orders direct from consumer at manufacturer's prices. District or local agents. Write Nopulout Shirt Co., Dept Y, Hazleton, Pa.

PHOTO Medallion Men and Women, the largest line of Photo Novelties in the world. Lowest prices, quickest service. Send for catalogue showing over 200 money makers. Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-614 Gravesend Ave., Brooklyn, N. Y.

AGENTS make $10.00 Daily selling Non-Splash Water Filters on sight. Best canvasser's article on market. Investigate. Write for particulars, Desk 14, Seed Filter Company, 73 Franklin Street, New York.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147-C New Jersey Ave., Brooklyn, N. Y.

REPLATE brassy worn-off Automobile Parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. $1.00 half pints. Post Paid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

$50.00 WEEKLY easy. Applying Gold initials on Automobiles. No experience needed. $1.45 profit every $1.50 job. Free samples. "Ralco Monograms," X1043 Washington, Boston, Mass.

WANT Distributing Agent for Handslick, powdered hand soap; removes anything from hands; everybody a customer; sample free. Solar Products Co., J-2142 S. Troy, Chicago.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

SUCCEED With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

"HOW to Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

GOLD-LEAF Sign Letters; copyrighted Manufacturing Instructions; profits 1,000%. Johnston Co., Quincy, Ill.

JIFFEX—Pays all profit! Invest $1.00, make $20.00. Enclose $1.00 bill, receive charges prepaid Jiffex for 10 gallons (80 pints) earning you $20. Jiffex Amazing Glass Cleaner, cleans, polishes windows, windshields, showcases without water, soap or chamois. Wonderful demonstrator. Everybody buys on sight! Receive also many other agent's profitable paying propositions. Satisfaction guaranteed. Miller, Chemist, 1706-F Jetton, Tampa, Fla.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS—Here's a New One. "Bestever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply coining money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 4315W Irving Park, Chicago.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instruction or write for free book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 138 and 139.

A BUSINESS of Your Own—Making Sparkling Glass Name and Number Plates, Checkerboards, Signs. Big Book and Sample Free. E. Palmer, 512, Wooster, Ohio.

32 SECONDS complete tire change by Detmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days, cleared $100. Anderson, Mont., sold 1400 in 14 weeks. Get details for good territory. Harvest time Now. M. Morey Rim Tool, Buffalo, N. Y.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marui Company, Tribune Bldg., New York, N. Y.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derma Co., Dept. A, St. Louis, Mo.

AGENTS make $100 week furnishing Cigar Lighters to merchants on free advertising plan. Particulars sent free, write at once. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAGIC Polishing cloth—Great Seller. Big Profit. Free Sample. Get this proposition. Newton & Co., 50 Main St., Newark, New York.

$1,000.00 REWARD if this is not the greatest money-making house to house proposition ever known. N. R. G. tablets wash clothes in 10 minutes without rubbing. Free Samples. N. R. G. Co., H232 W. Superior, Chicago.

SHOW Us the housekeeper who likes to clean stair corners. Earn big money installing Ideal Corner Dust Shields. Write today. Ideal Stairway Equipment Co., Canton, Ohio.

OUR Luminous Crucifix Shines in the Dark. Every one amazed at the wonderful effect. Easily demonstrated—easily sold. W. G. Hannan Co., 2543 So. State St., Chicago.

SOMETHING New. Every motorist a buyer of our electro-magnetic-emergency Wonderlamp; takes only one minute to demonstrate and make a sale; no experience necessary; $5.00 an hour easily made; full time or evenings. Write for sample. Wonderlamp Co., 926 Fisk Bldg., Dept. 10-A, New York.

A BUSINESS of your own! Sell, demonstrate home work shop outfits. See Up-To-Date Machine Works display ad page 155 this issue.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet Articles, Household Specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

BIG profits distributing 5c candy specialties to dealers. Fast sellers. Exclusive territory. Universal Sales Company, 631-B Wilson Ave., Brooklyn, N. Y.

WE Trust Agents!—Starter Stock and Reorders on Credit—no bond signers. Finest line 200 guaranteed Extracts, Pure Foods, Toiletries. Big Profits. Write for details. Perkins Products, E-3, Hastings, Nebr.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

WE Have the finest needle case, self-threading needles, needle threaders. $50.00 to $200.00 weekly. Samples 25c, particulars free. Empire, 1549 N. Wells, Dept. 201, Chicago.

WRITE Atlas Sign Works for free working equipment. Beautiful window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience Unnecessary. Carnation Co., 2480, St. Louis, Mo.

SELL Supreme No-Cement tube and tire patches. 310% profit. Particulars. Write Supreme, 135 Winder, Detroit, Mich.

HIGH-GRADE SALESMEN WANTED

AGENTS—$13.80 Daily in advance. Introducing New Insured Hosiery for men, women, children. Must wear or replaced free. 57 styles, 39 colors, including latest "Silk to the Top" Ladies' Hose. Nyland made $595 in one month. Edwards, $460.60. Mrs. Bone, $425.45. Why not you? Even spare time should pay you $3.00 an hour. No experience needed. We furnish samples. Silk hose for your own use Free. New Plan. Write quick. Macochee Company, Park 2564, Cincinnati, Ohio.

MAKE $15 Day Demonstrating The Handyman Tool! Pulls posts, pipes, roots, small stumps; jacks up trucks, tractors, wagons; lifts buildings; stretches fence; splices wires; makes cider press; dandy rim tool! Dozens other uses. Simple to operate. Lifts, pulls or pushes with three-ton capacity. Money-back guarantee. Live man wanted every county. Get our sales plan and make Big Money. Harrah Mfg. Co., Dept CD-180, Bloomfield, Ind.

HERE At last; Mech-O-Nurse. Mechanical feeding device for babies; newly invented. See March issue Popular Mechanics, page 396. Agents of character, write for information. Mech-O-Nurse Co., Dallastown, Pa.

ENGRAVED Nameplates, Signs, Numbers, Initial, Desk, City Nameplates. Big profits. Hilton Specialty, 90 Stewart, Providence, R. I.

YOU Can start a paint business. Expense small. Profits large. Free particulars. Emmelmann Bros. Mfg. Co., Dept. 2, Indianapolis, Ind.

EXTRA Money—Thousands of positions are open to men and women who will devote a few hours a day to selling hundreds of lines of novelties and everyday necessities. Send 10c in stamps for booklet, "How to Start As a Direct Salesman," published by largest direct selling magazine in the world. Send for it today. Opportunity Magazine, Dept. PM-4, 750 North Michigan Ave., Chicago.

AGENTS: Our gold-eyed Needle Cases are wonderful sellers; immense profits; $50 to $300 weekly; proof and particulars free; sample outfits 10c; factory prices. Paty Needle Co., 231 Davis Square, Somerville, Mass.

SELL Bedding. Factory Prices. Write, Woolen Mills, West Unity, Ohio.

TWO Money Makers for Agents. "Francia" Pocket Adding Machine retails $4.85. To you $1.00. "Excellograph" Rotary Stencil Duplicator $37.50 retail. Write Typewriter Supply, 102 Hersch Bldg., Pittsburgh, Pa.

NEW Successful Automobile Product; every motorist interested, especially New Fords; large sure profits. Proposition and two demonstrators one dollar, refunded first order. Ritter Manufacturing Company, 238 Logan Street, Brooklyn, N. Y.

EXPENSIVE Dresses. (Slightly handled Samples.) Sacrificed cheap. Peddlers, storekeepers, agents write Hirschlar's, 249 West 34th, New York.

WHY Sell Non-essentials? Home Necessities repeat. DUO Double Strength Extracts, Toilet articles, full line of specialties can't be beat. Big profits. Write quick. Duoform Co., N-1, Attica, N. Y.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent.; put it on cold, it vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

CAN You sell a washing machine for $9.75? Agents are making $75.00 to $300.00 weekly showing new automatic washer to housewives. Thoroughly cleans and sterilizes. No rubbing necessary. Write for protected territory. Storm Royalty Co., Inc., 3601 Enright, St. Louis, Mo.

TAKE Orders for New Orthophonola Portable Phonographs; Sells $19. Commission $8. Outfit Free. Orthophonola Mfg. Co., 757-F Broadway, New York.

"WHISKETTE" — Cleans and polishes aluminum like new. Won't scratch. Agents coining $$$. "Whiskette," 3240 N. 13th, Philadelphia, Pa.

100 MORE Active men to Introduce "Chieftain" Guaranteed Tailored Shirts, 3 for $4.95. Latest novelties, colors, styles. Dickman, Illinois, in 3 weeks made $589; Sinton, Texas, in 12 days, $219.60. Bend, Iowa, in 16 days, $334.80. Why not you? No experience or capital needed. We deliver and collect. Full working outfit Free. Cincinnati Shirt Company, Shop 1584, Cincinnati, Ohio.

PATENTED Utility Kit combines Compass, Square, Calipers, sliding rule and pencil sharpener into compact Pocket form. A winner for Agents, Demonstrators and Mail Order Men. Sample Outfit 50c. Jas. Mayhew, 296 Broadway, New York.

SEND name, address on postcard. Free introductory copy Modern Salesology Magazine; 1000 money-making opportunities offered by big reliable firms; no obligation. Salesology Magazine, Desk B-39, 500 No. Dearborn, Chicago.

JUST One Changeable Letter Electric window display with moving colors and light—The Luminate. Our boys get the big money. Don't risk patent infringements—sell the original. 1928 refinements and added features make todays' Luminate irresistible. A weather-proof number for outdoor use. Join the Luminate money-makers. Display Products Company, Ltd., 405-9A, East 31st St., Kansas City, Mo.

$10 TO $20 Daily easily earned selling shoes for the largest direct to wearer concern in the world at saving of $2 to $3 pair; some good protected territory still open. Doublewear Shoe Co., Minneapolis, Minn.

EARN $20 a Day. Establish income for life selling for $1 a year, $1,500 accident policy. Write W. C. Stone, 11 So. La Salle, Chicago.

A PAYING Position open to representatives of character. Take orders shoes-hosiery direct to wearer. Good income. Permanent. Write now for free book "Getting Ahead." Tanners Shoe Mfg. Co., 354 So. C St., Boston, Mass.

INCREASE Your Income $25 to $75 Weekly seling our Japanese Imported Panels, Advertising Pencils and other Specialties. Liberal commissions. Klein Advertising Co., Quincy, Ill.

MR. BRUSH Salesmen—Old Established New York Brush Manufacturers require services of men in all territories to sell their extensive line of Sanitary Twisted in Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for proposition. Wire Grip Sanitary Brush Corporation, 41-51 East 11th St., New York.

BIG Season Just Ahead. Advertising pencils most popular every day—every business prospect. Our line repeats. Big commissions. Established in 1902. North American Pencil Works, 126 So. Clinton, Dept. 55K, Chicago.

SALESMEN—Semi-Liquid rubber repairs punctures and blowouts without heat or tools. Everyone buys. Salesmen coining money. Get territory quick. Marquette Co., 2325A Wolfram, Chicago.

LARGE Manufacturer of made to measure raincoats and gabardines, has unusual hustlers' proposition; $75 weekly easy. Outfit free. Standard Raincoat, 367 Sixth Ave., New York.

PUNCHBOARD Salesmen. $200 weekly. Liberal plan assures sales. Latest assortments. Nothing to carry. Full commissions on repeats. M & L Sales Co., 182 No. Wabash, Chicago.

WONDERFUL Free Selling Outfit with actual samples of Bostonian Broadcloth makes quick sales for our Nationally Known Bostonian Shirts at 3 for $6.95, Postage Paid; $9.00 value; guaranteed fast colors. Liberal cash commission of $1.50 on each order of 3 shirts means Big Money for you. Bostonian Mfg. Co., Dept. M. 2., Boston, Mass.

FREE Lance Salesmen. Advertising Rulers, Yardsticks—Used by all Classes of Trade. Canisteo Ruler Mfg. Co., Canisteo, N. Y.

MEN—Sell dependable shrubbery, fruit trees, etc. Steady demand. Complete cooperation. Commissions paid weekly. We deliver and collect. Write Perry Nurseries, Dept. R-4, Rochester, N. Y.

SELL Printing. Big commissions. Outfit Free. Atlas, 2622-G East Tenth, Indianapolis, Ind.

SALESMEN—Introduce furnace carburetor that makes two tons of coal do the work of three. No smoke; no soot. Write for big money-making proposition. The Campbell-Hausfeld Co., Box 7, Harrison, Ohio.

DON'T Sell for others. Employ agents yourself. Make your own products. Toilet articles, Household Specialties, etc. 500% profit. Valuable booklet free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

MAKE $25.00 daily selling colored Raincoats and Slickers, Red, Blue, Green, Etc., $2.95—Hat free. Commissions daily. Outfit free. Elliott Bradley, 230 So. Wells, Dept. AB4-S, Chicago.

BIG Pay Every Day! Complete guaranteed line direct to wearer—Dress Shirts, Work Shirts, Overalls, Coveralls, Work Pants, Sweaters, Underwear, Playsuits, $10-$15 daily; experience unnecessary. Big Outfit Free! Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

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$165.00 FIRST day's profit made by Walker. He says our Collection System easiest selling line to merchants he ever handled and he is now making more money than he ever dreamed was possible. The System retails for $6.50. Collects at least $65.00 and costs only $1.50; $5.00 profit on each one sold. Write at once for complete details. Adjustment Bureau, Mobile, Ala.

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SALESMEN—Four $15.00 sales to merchants net you $40.00 daily. Sayers Systems, 2813 Sheffield, Chicago, Ill.

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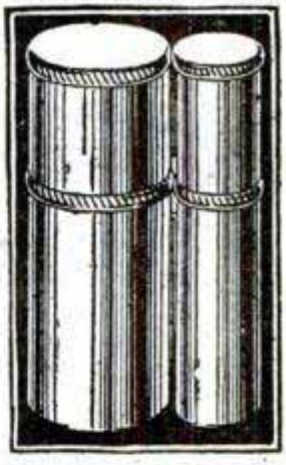

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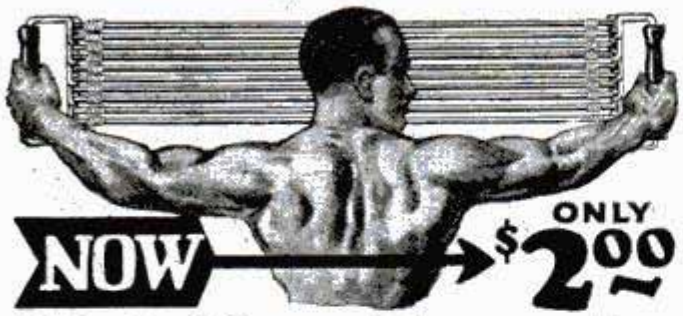

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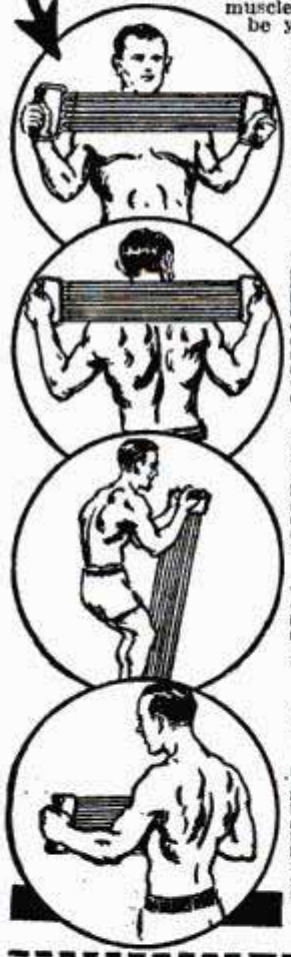

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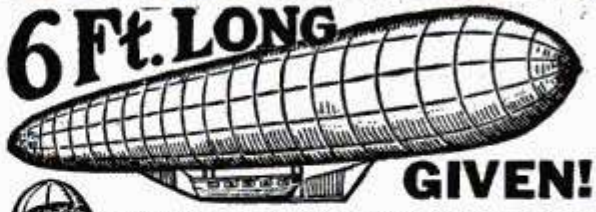

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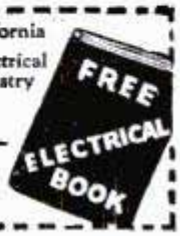

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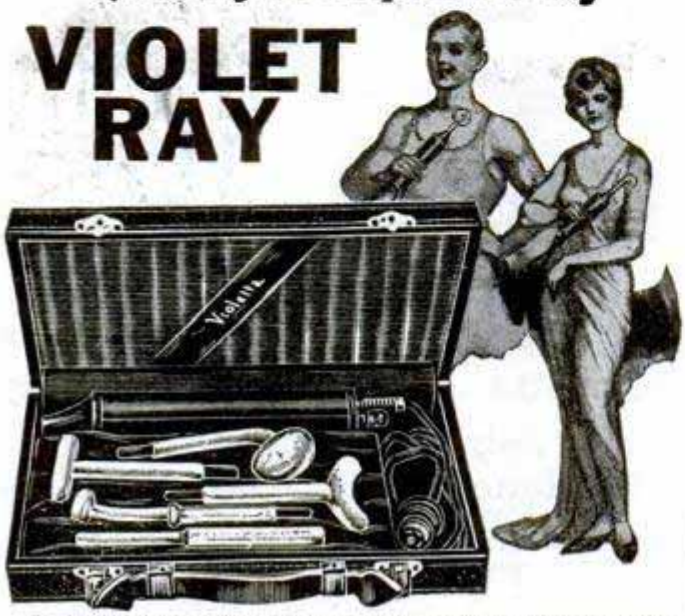

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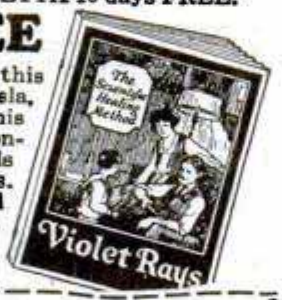

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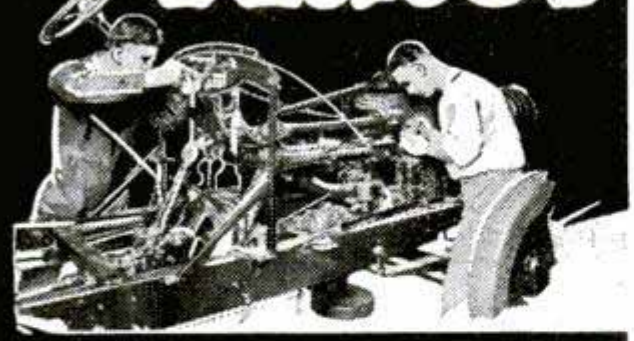

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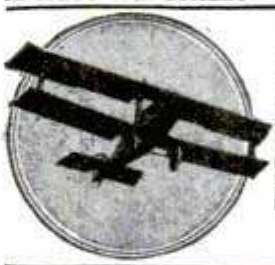

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Alois Merke developed this remarkable hair-saving treatment only after exhaustive experiments with hundreds of actual cases. Research proved conclusively that most cases of hair trouble are caused by germs or microbes.

These insidious germs burrow into the scalp to the hair roots and smother them—render them inactive. Thus, the supply of nourishment to the hair is cut off—hair and scalp become dry and lifeless—dandruff forms—and the hair starts falling out.

Ordinary hair restorers, dandruff remedies and scalp salves usually fail to overcome this condition because they treat only the *surface* of the scalp while the treacherous germs, unaffected, carry on their harmful work underneath.

New Treatment Kills Germs

Merke Derma Vial Liquid, as this new treatment is called, works its way below the surface of the scalp and kills the trouble-making germs embedded.

At the same time it acts to set up in the scalp a vigorous circulation of the blood which carries to the hair roots the natural, vital nourishment so necessary to hair health and growth. Thus dandruff usually disappears entirely—hair should stop falling out—and again take on new, natural, healthy life and lustre.

We quote from a report rendered by one of the world's foremost research laboratories after making exhaustive tests with this liquid—"The results indicate that the tonic *killed* the test organism (bacteria) *in less than three minutes*. The results also indicate that the tonic is capable of penetrating and preventing the growth of the test organism (bacteria)."

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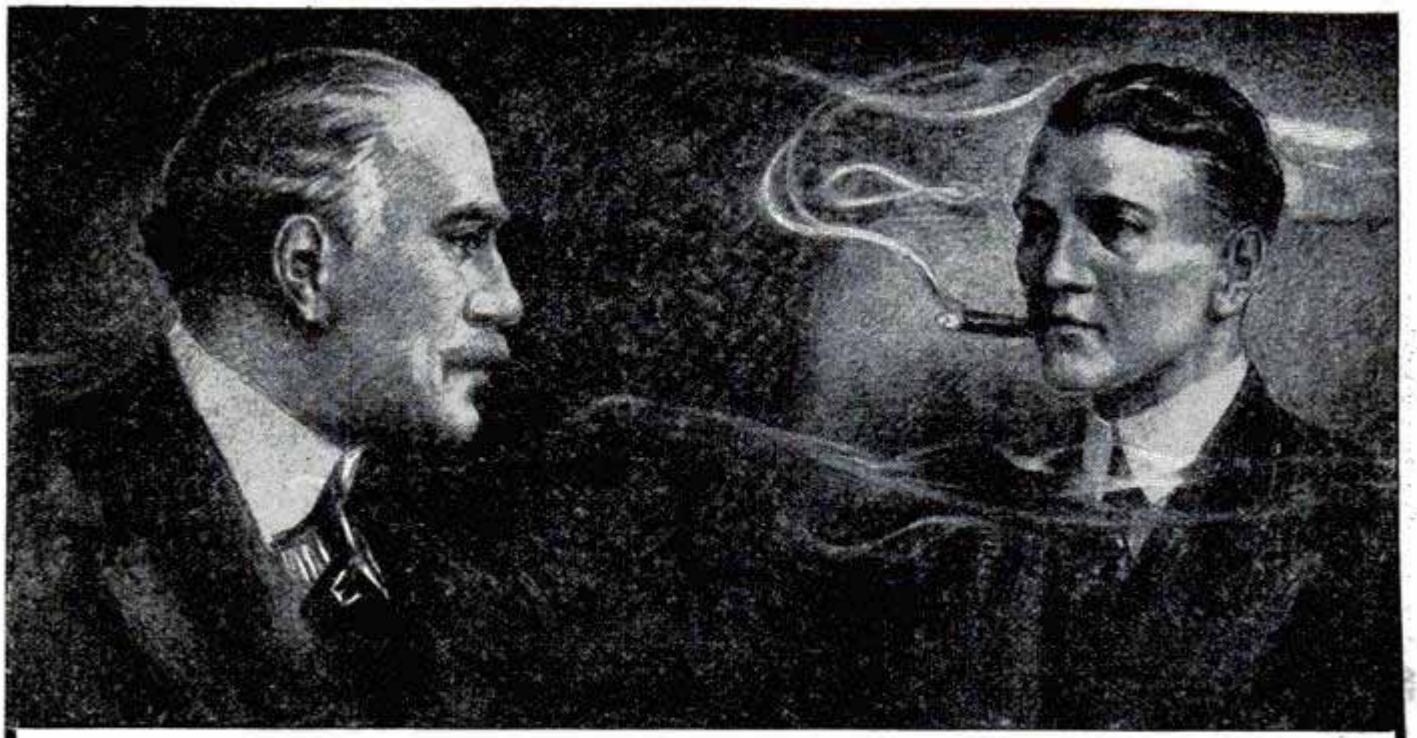

Tobacco Is Hurting You

Look at the facts square in the face, Mr. Tobacco User. You may think tobacco is not hurting you.

That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For **you** know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but **sure.**

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco **has** undermined your system.

When your hands begin to tremble—
and your appetite begins to fail—
and your heart seems to "skip a beat" now and then—
and slight exertion makes you short of breath—
then you have a right to suspect that
TOBACCO is getting the upper hand.

Any well-informed doctor will tell you that these are only a few of many symptoms of tobacco poisoning.

And **YOU** know that the use of tobacco in **any** form is an **expensive,** utterly useless habit. You know you **ought** to quit.

Tobacco Habit Banished

Let Us Help You

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—Tobacco Redeemer will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

It is in no sense a substitute for tobacco. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves and make you feel better in every way.

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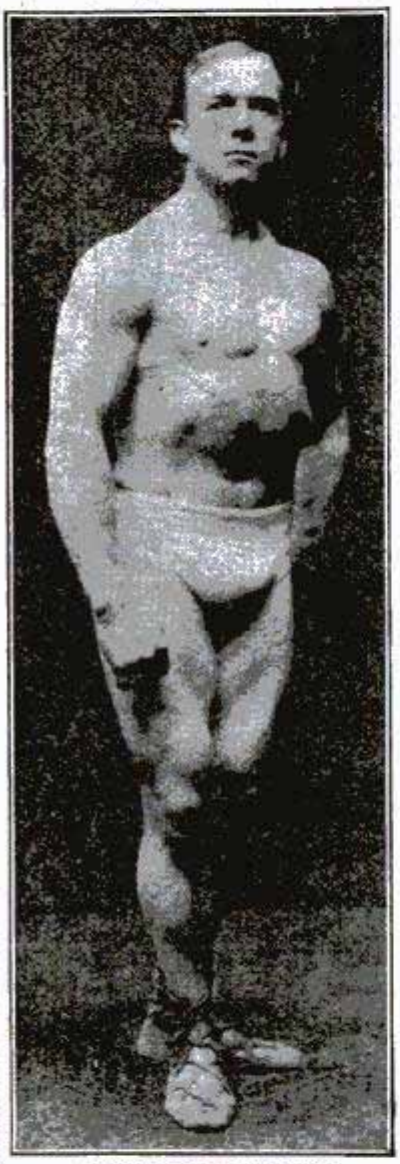

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Dr. Sargent, of Harvard, declared that Strongfort is unquestionably the finest specimen of physical development ever seen.

Here's something that ought to make you sit up and take notice if you are lacking in energy, pep and staying powers. "Physical weakness is a crime"—many states say so when they require certain physical qualities in applicants for marriage licenses. "Physical weakness is a crime"—the United States Army and Navy say so when they put you through a rigid physical examination before enlistment. Big corporations say so, too, by insisting on higher physical standards in their employees. **There is no place for you if you are a weakling!**

If you are a nervous, timid, fidgeting, shambling fellow, you are not wanted anywhere—you don't attract men or women—you repel them. You can't indulge in the ordinary pleasures of life. You can't enter sporting contests—you lack the energy and stamina of the athlete. You don't get on in school or college—the fellows won't stand for your ailing and complaining, and your mental gloom. You can't hold down a good job—you are too languid and pepless. Your outlook on life is marred by fits of the blues.

Nature exacts a terrible penalty when you've gone too far with her. She whips you into such a state of debility and despair that you become a miserable specimen of a man—an object to be pitied or shunned.

DON'T FOOL WITH DOPE AND DRUGS

Man, you won't get anywhere experimenting with drugs, dope and booze to stimulate the system. Gymnastic apparatus, stretching, pulling and lifting machines often aggravate your condition. Starvation diets may merely weaken you more. Electrical and many other trumped-up treatments, muscle manipulation, baths, ordinary physical culture, forced deep breathing, mystics—all fail to get to the cause of your weaknesses and diseases. Nature only can help you. Nature is supreme in the regulation, restoration and revitalizing of the human body. But you must give Nature a chance—you must help her—and this you can do most certainly, most effectively through

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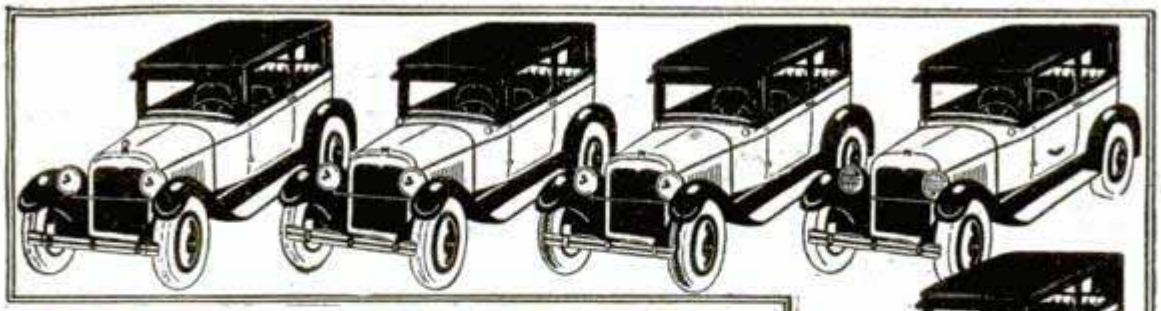

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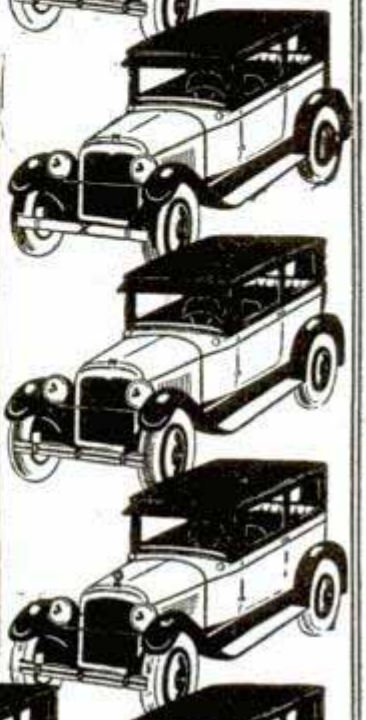

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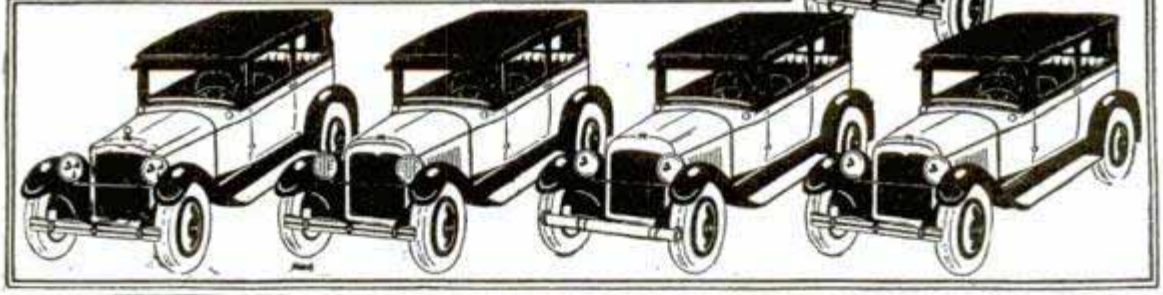

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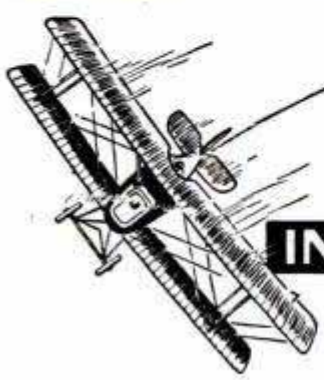

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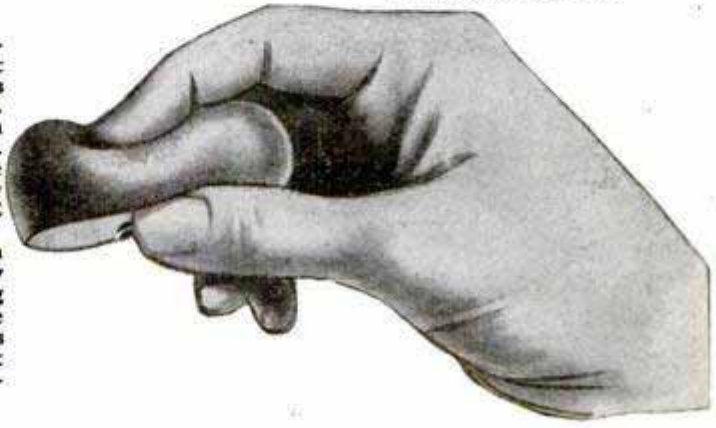

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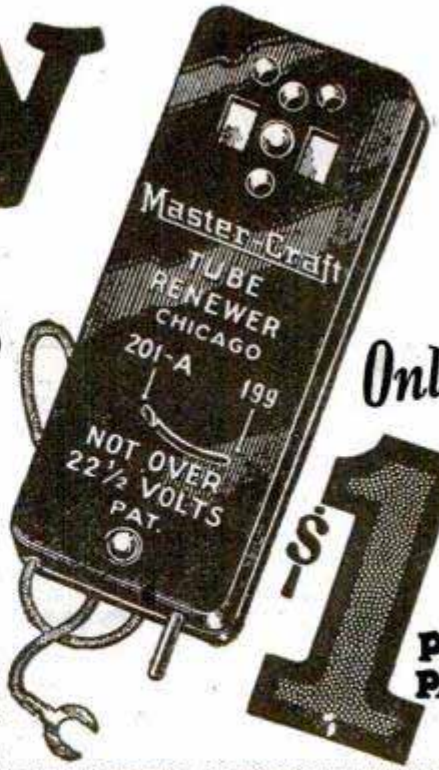

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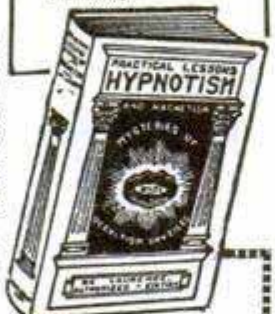

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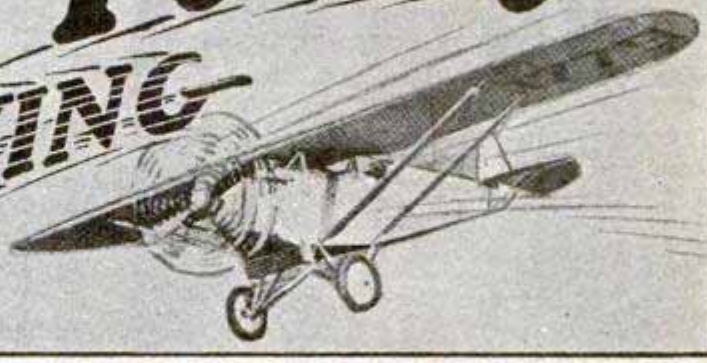

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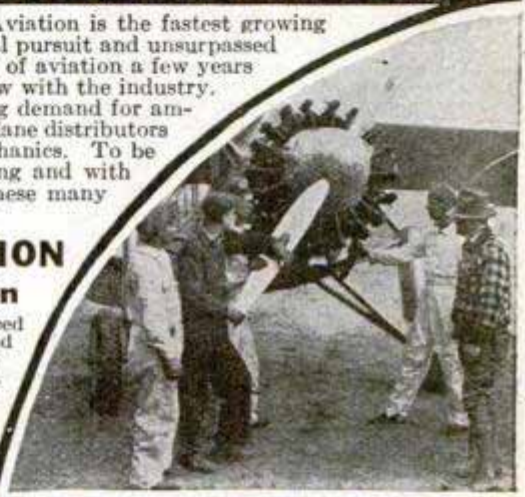

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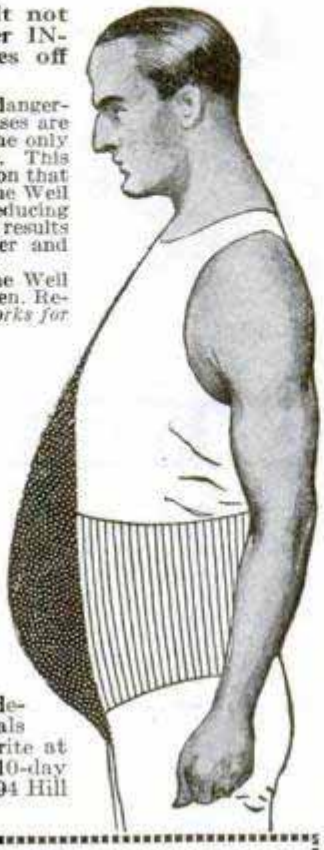

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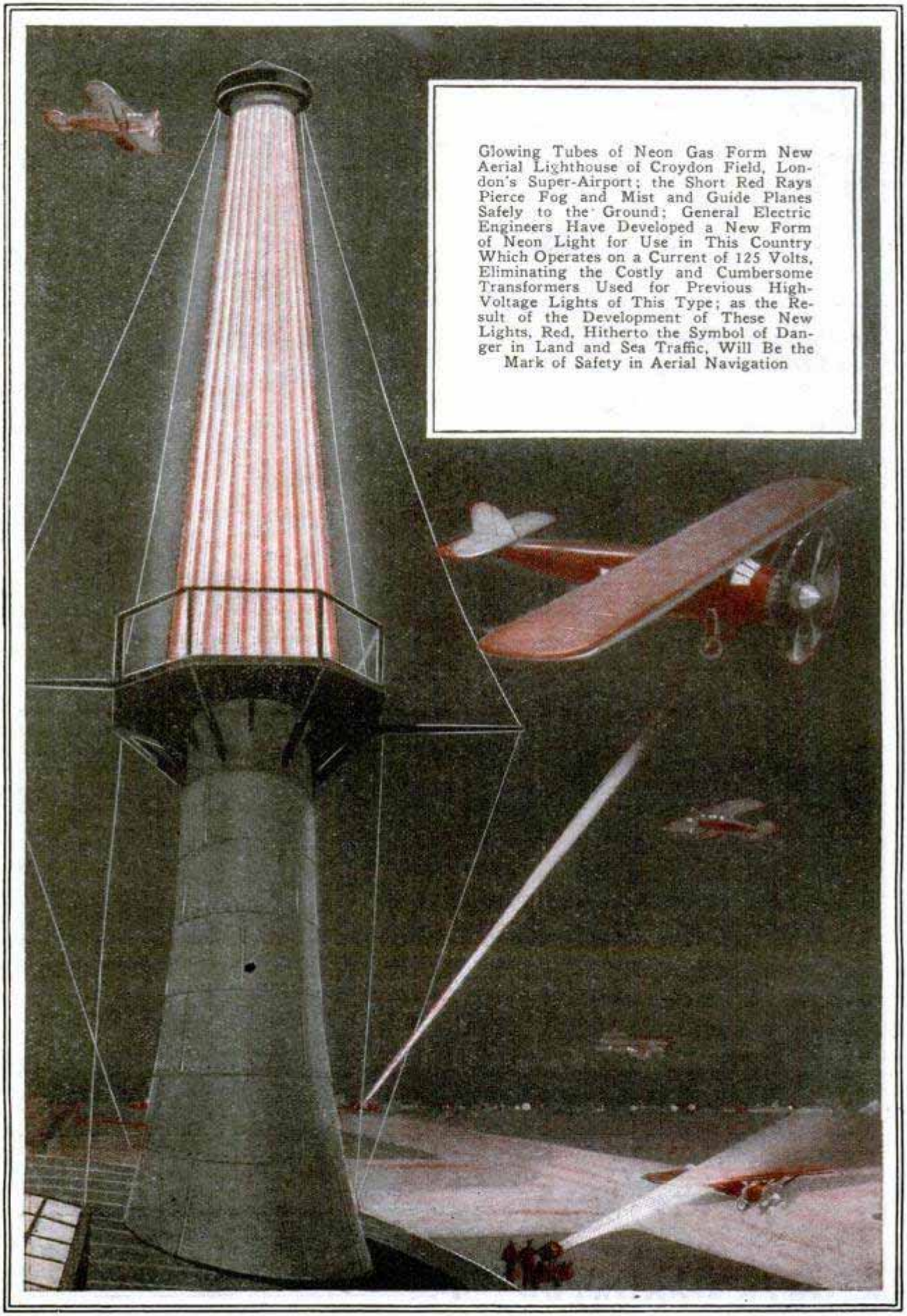

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Vol. 49 APRIL, 1928 No. 4

88

Television for the Home

Behind a Little Three-Inch-Square Aperture, the Moving Picture from the Radio Studio Appears, While the Watcher, with a Push Button in His Hand, Keeps the Picture Synchronized

GROUPS of people sitting in various homes at Schenectady, N. Y., a few weeks ago, saw the performers in a distant broadcasting studio flit across a tiny screen, and from the loud speaker of a radio set heard them talk.

Television, a laboratory plaything that has interested scientists for several years, had arrived.

A large, square cabinet, built somewhat like the bigger talking-machine models, is the first home receiver for radio-transmitted images. The dials of a receiver protrude from its middle, and above them, at the eye level of the seated spectator, appears a three-inch-square window, behind which is the screen on which the images are formed.

The one great problem that has perplexed television experimenters for years —how to synchronize the transmitter and the receiver—was solved by simply ignoring it. Instead of all the elaborate, and very expensive, equipment necessary to keep the whirling disk of pinholes that paints the image on the receiver screen in absolute step with the corresponding mechanism that transmits the original

Cont. John T. Brady, Boston Sunday 529
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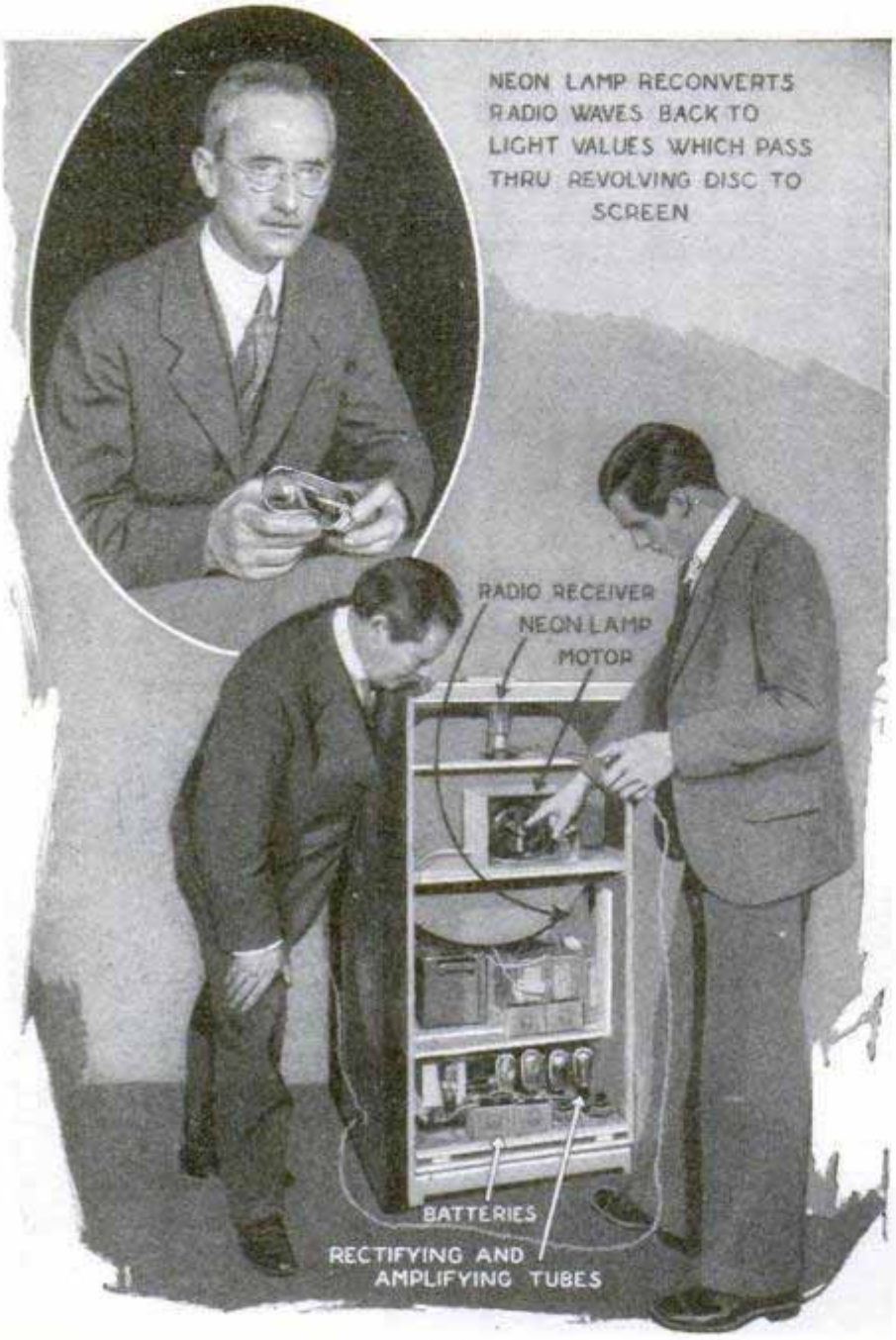


The Motor-Driven Pinhole Disk, the Neon Lamp That Reproduces the Image and the Picture Receiver

image, the television receiver for home use has a simple rheostat control on the end of an extension cord that permits the spectator to do the synchronizing himself. If the receiving motor runs a trifle fast or a bit too slow, the picture will begin to get out of focus—to slip off the screen. The effect is much like that at the movie theater, when the "frames" of the moving film and the shutter do not work in unison and you see the bottom half of one frame and the top half of another on the screen. The operator makes a simple adjustment to the projector, and the picture is restored to position; and in the same way a slowing down or speeding up of the television-receiver motor brings the picture back into place.

"It is as simple," explains Dr. E. F. W. Alexanderson, of the General Electric laboratories, who developed the machine, "as learning to drive an automobile."

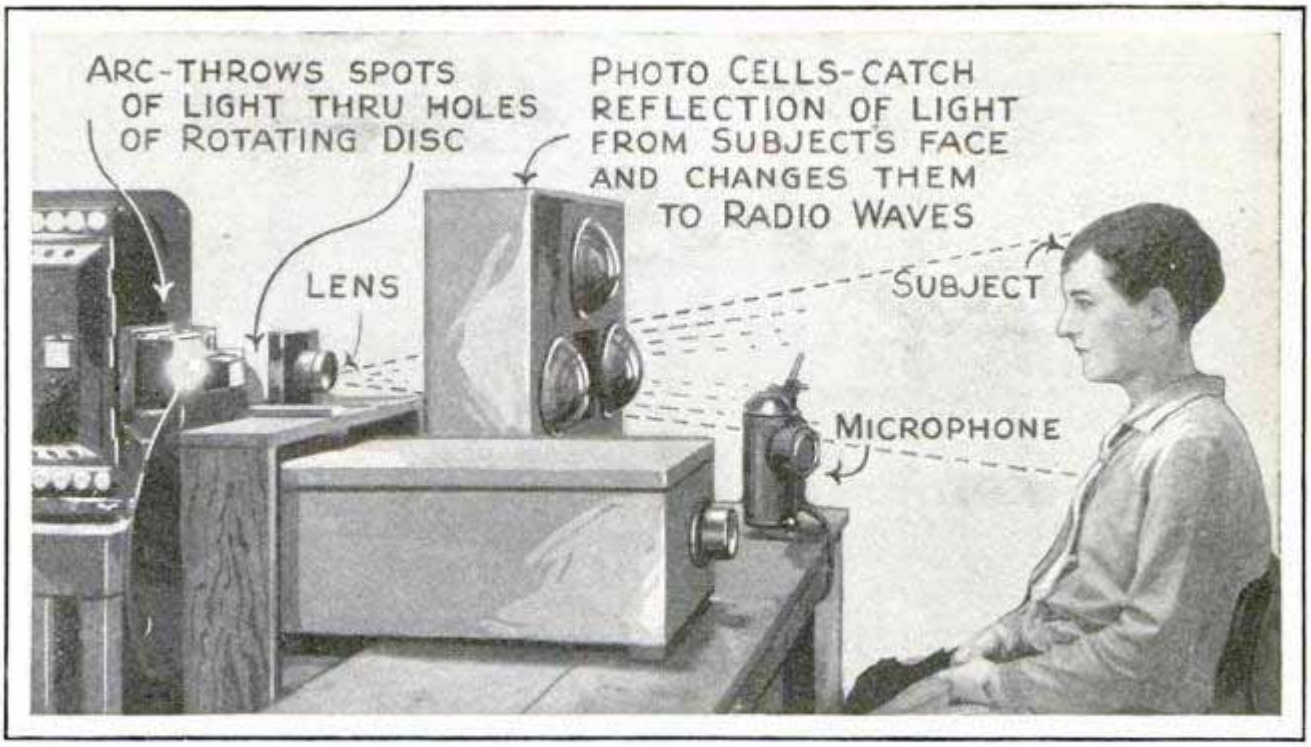
David Saranoff, vice president and general manager of the Radio Corporation of America, predicts that within five years television will be an art and an industry in this country.

Here is how the first practical demonstration in the home worked:

In the studio the performer stands before an ordinary arc light. Between him and the light is a large disk, revolving eighteen times a second, and in the disk are forty-eight holes, arranged in a spiral, so that, in each revolution, successive beams of light are swept across each part of the performer's face. A photo-electric cell is directed toward the performer, and as each light beam is reflected back from his face, it affects the cell, which converts the light into electrical energy.

From there on, the transmission system differs in no important respect from the usual broadcasting outfit. The tiny current wave from the photo cell is magnified and amplified into a powerful signal, which is then dispatched into the air through the antenna on a wavelength of 37.8 meters. The antenna is a new type, the wires arranged in a checkerboard square, each wire being half a wavelength long and so coupled that they are always in phase, eliminating the necessity of antenna tuning. The WGY transmitter, on its usual wavelength of 379.5 meters, was used for the accompanying voice transmission.

In the home there are two receivers,



The Transmitter for Radio Pictures Is a Battery of Sensitive Photo-Electric Cells That Transfer the Reflected Light into Electric Current to Be Broadcast through the Air

one to pick up the voice, on one wavelength, and deliver it, amplified in volume, to the loud speaker. The other, operating on a different wavelength, receives and amplifies the electrical signals produced by the image. Instead of being connected to a loud speaker, the output of this receiver goes to a small "cold light," a neon-gas-filled bulb, which is so sensitive that it can be turned on and off a million times a second, if necessary, with no lingering afterglow, and which has the peculiar property of producing its glow on one side of a targetlike electrode only.

In front of the neon globe, a duplicate of the pinhole disk at the broadcasting station is revolving eighteen times a second, kept in step by the control in the spectator's hands. As its forty-eight apertures sweep in turn across in front of the light, they pass the pulsating light beams, now rising in brilliancy for a high light, and then fading off for a shadow. The disk is twenty-four inches in diameter, and the forty-eight holes each thirty-five millimeters across. The distance between the outer and inner holes of the spiral is calculated to make an image only an inch and a half square, but between the disk and the spectator's window is a magnifying lens that doubles the picture each way, bringing it up to three inches square.

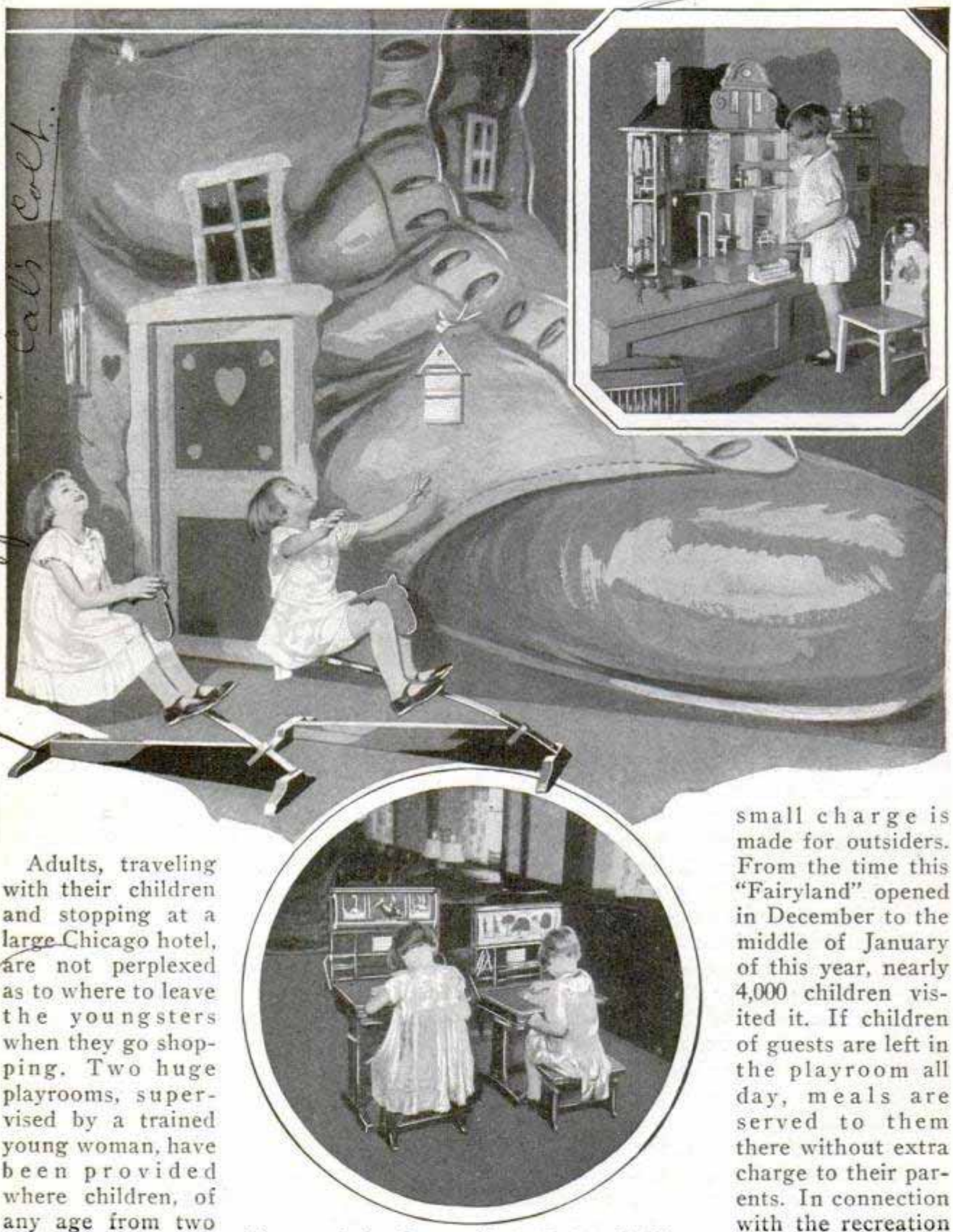
The rate of revolution of the disk—eighteen times per second—produces a corresponding number of images, or two more per second than are seen when movie film is operated at standard speed.

The Moore neon lamp, invented by D. McFarland Moore, an engineer of the Edison lamp works of the General Electric company, gives the picture a distinct pink cast, one of the characteristics of neon which is seen in the new type of signs now in use.

In the demonstration at Schenectady, performers in the studio talked, moved about, lit and smoked cigarets, exhibited their bobs and permanent waves, and performed other stunts. As all the apparatus as yet built has such small receiving screens, no attempt has been made to transmit an entire studio scene, an orchestra playing, or even a full-length portrait of a moving person.

One of the interesting things about the television demonstration is that, when the broadcasting of images becomes a regular feature, anyone will be able to build receivers, for none of the principal features will be covered by basic patents. The revolving disk, the neon lamp and the photo-electric cell are all old inventions. There are patents, of course, on the improved features of late models, but the basic ideas involved all date back before the days when radio pictures were thought of.

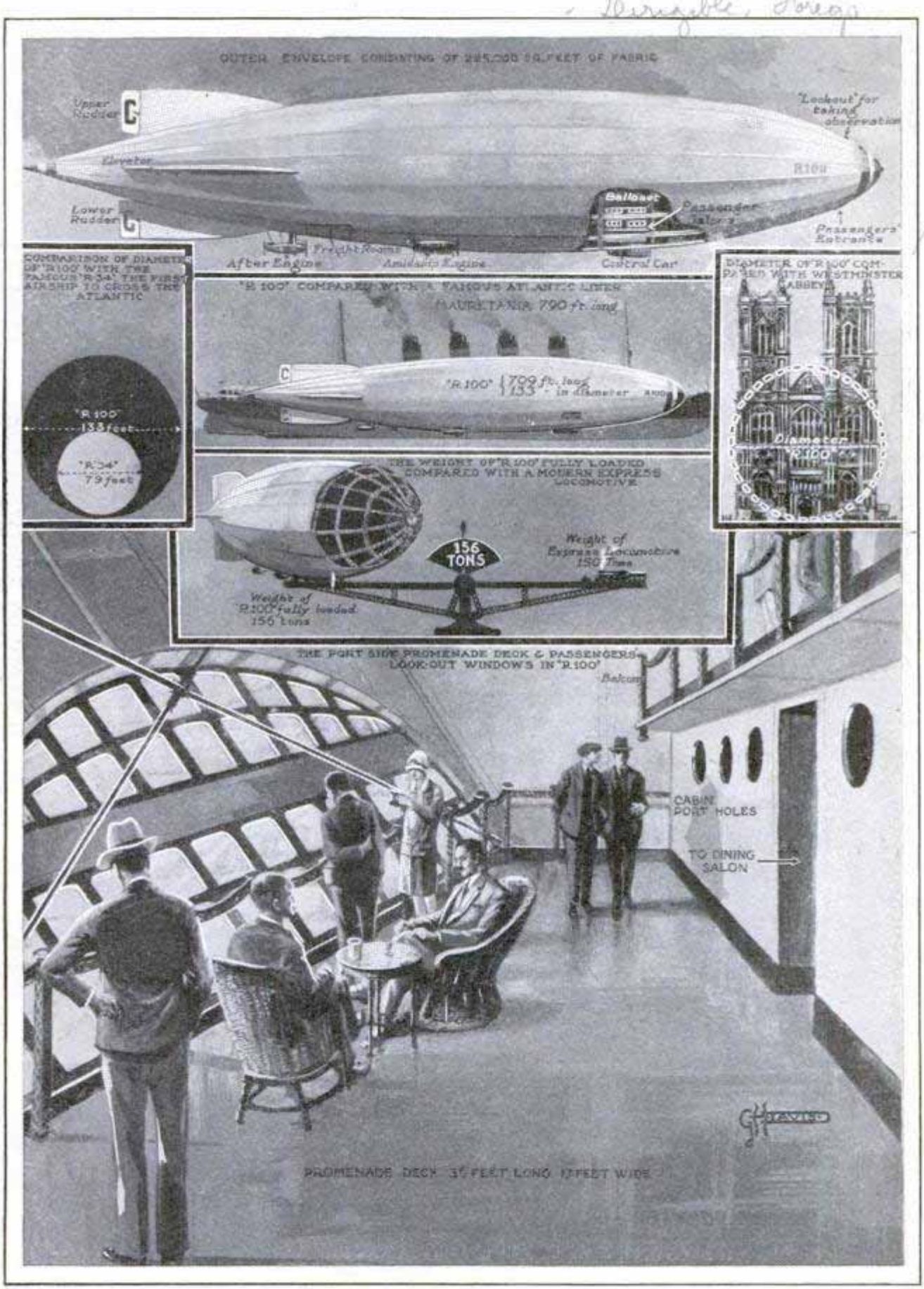
MODERN FAIRYLAND ATTRACTS HOTEL CHILDREN



Glimpses of the Stevens Hotel "Fairyland" Where Youngsters May Play While Parents Shop

Adults, traveling with their children and stopping at a large Chicago hotel, are not perplexed as to where to leave the youngsters when they go shopping. Two huge playrooms, supervised by a trained young woman, have been provided where children, of any age from two to fifteen, may amuse themselves with toys, games and a wide variety of coasters, slides and other devices usually found in outdoor playgrounds. The service is free to guests of the hotel and a small charge is made for outsiders. From the time this "Fairyland" opened in December to the middle of January of this year, nearly 4,000 children visited it. If children of guests are left in the playroom all day, meals are served to them there without extra charge to their parents. In connection with the recreation facilities, classes in dancing and dramatic art are held. The walls of the rooms are attractively decorated with mural paintings of fairy-story scenes and the cloak room is hidden by a huge shoe.

TRANSATLANTIC FLYING HOTEL NEAR COMPLETION



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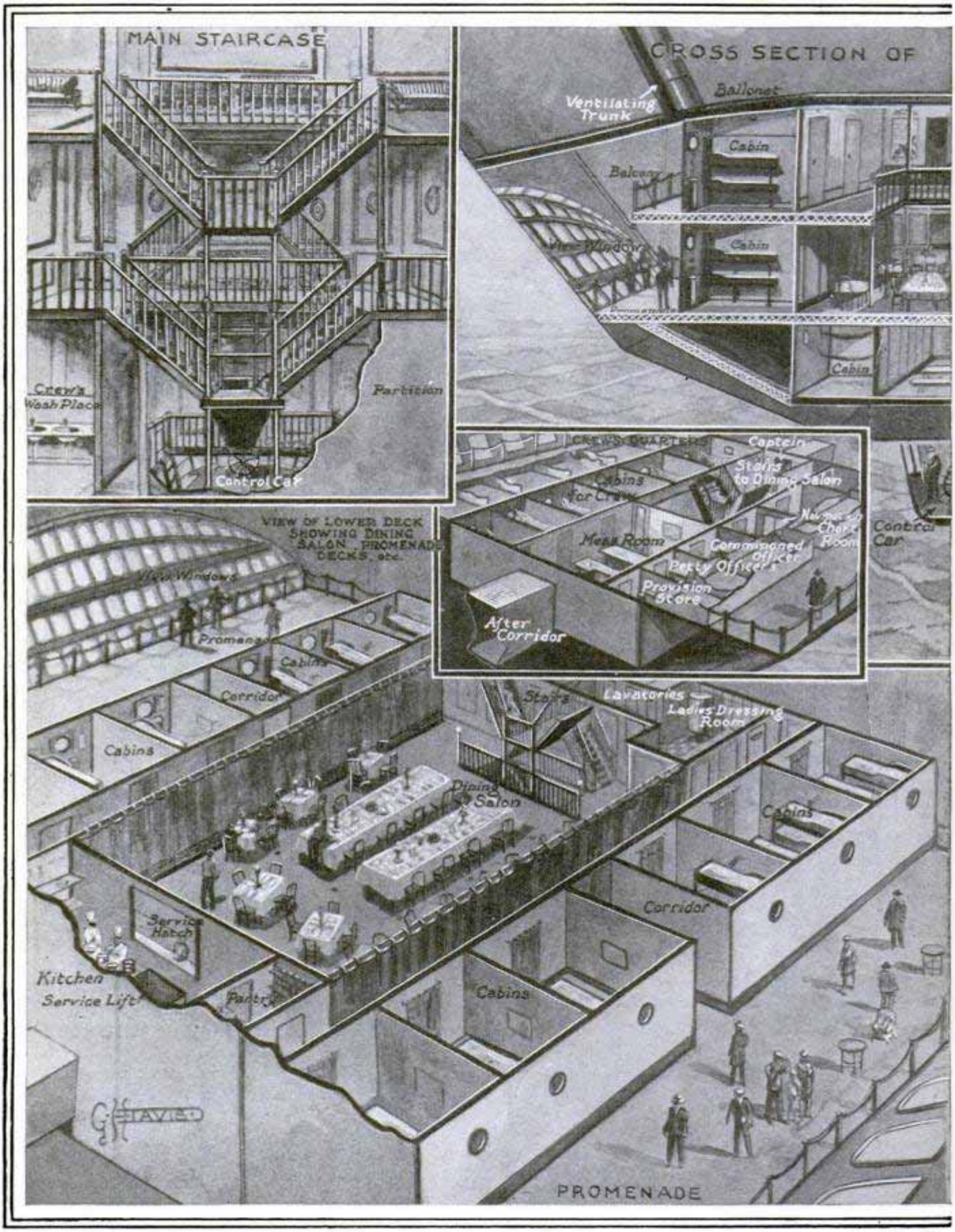
Nearly as Long as the Famous Liner "Mauretania," the "R-100," a Flying Hotel with Accommodations for One Hundred Passengers, Will Take the Air in England Some Time This Spring

LUXURIOUS ZEPPELIN LINER PROMISES NEW ERA



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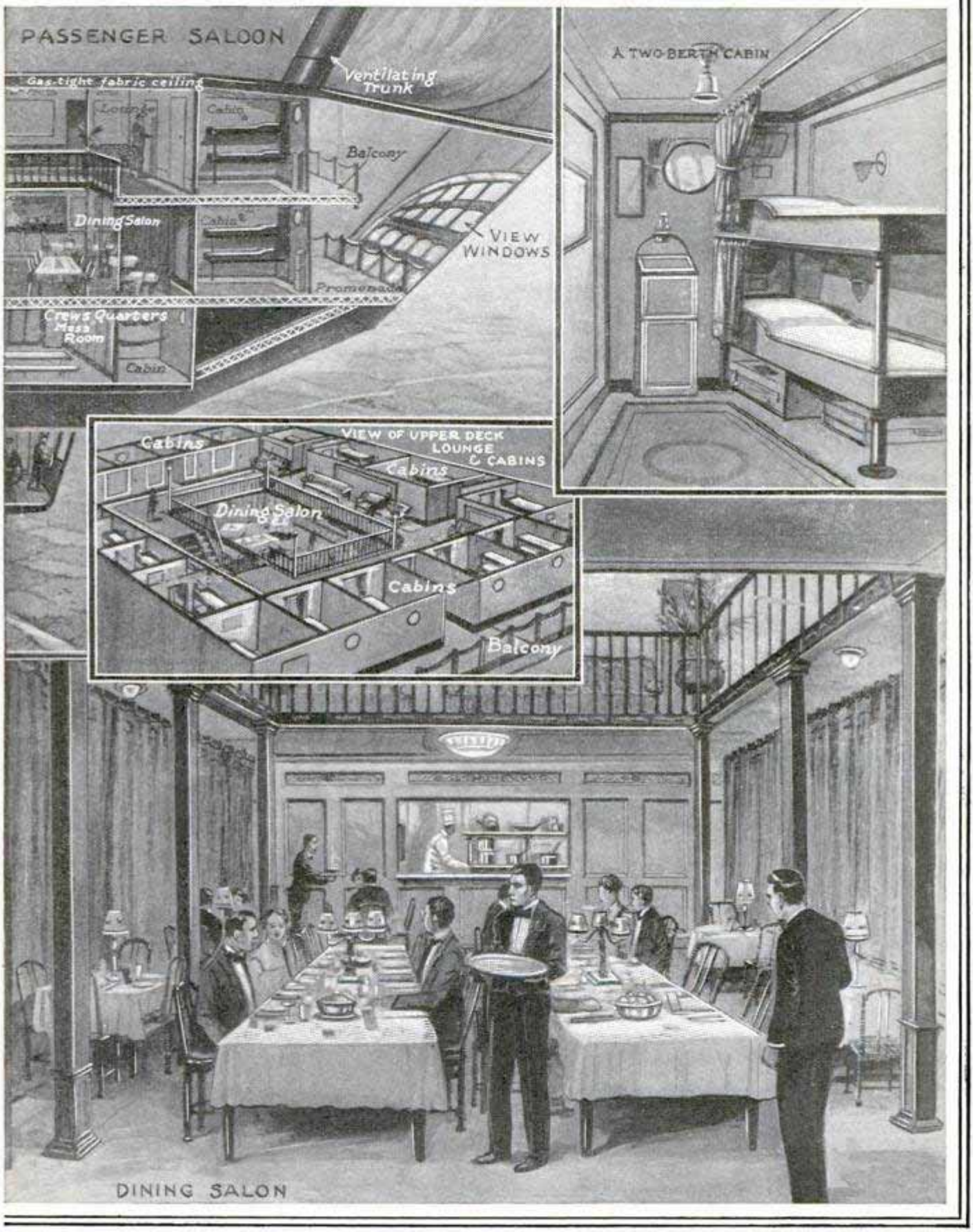
The "R-100," Being Built in England by Commander Burney, R. N., Famous as the War-Time Inventor of the Paravane, Is 709 Feet Long and 133 Feet Wide, Largest Airship Ever Built

IN OCEAN TRAVEL WHEN IT COMES TO U. S. SOON



the United States

Six Engines of 650 Horsepower Each Will Drive the Ship, While the Three-Story Hotel Section, So Light It Weighs But Twenty Tons Loaded, Has All the Comforts of Home

Cont. F. H. Hollingsworth, 160 Hartwell St Boston, Mass.

6

The Inventions

By JOHN T. BRADY in Boston Sunday Post 11/28

LOOKING ahead fifty years, Roger W. Babson, internationally known statistician, foresees the accomplishment of greater marvels of inventive genius and scientific discovery than any other age in the history of civilization has produced.

"The next half century will see wonders more amazing than Jules Verne or H. G. Wells ever dreamed of become realities," he declares, and he holds out the prospect that the advancement of medical and surgical science in extending man's span of life may make it possible for most of the present generation of middle-aged men and women to live to enjoy them.

The greatest development of the age is coming in the field of aeronautics, he believes, and he anticipates that a way will soon be found to link up passenger-carrying airplanes in trains which will eventually ply between all the large cities of the country and across the Atlantic, and make aerial travel as safe as railroad transportation is now and both speedier and cheaper.

And in the meantime, he expects helicopters to be developed to such a high degree of perfection that a man will be able to ascend into the air from a space no larger than the back yard of his suburban home and make a safe landing on the roof of his place of business.

of the Future

A Powerful Giant of the Electric Age; Huge Stator Winding and Connections with Supports on Inside Frame Structure

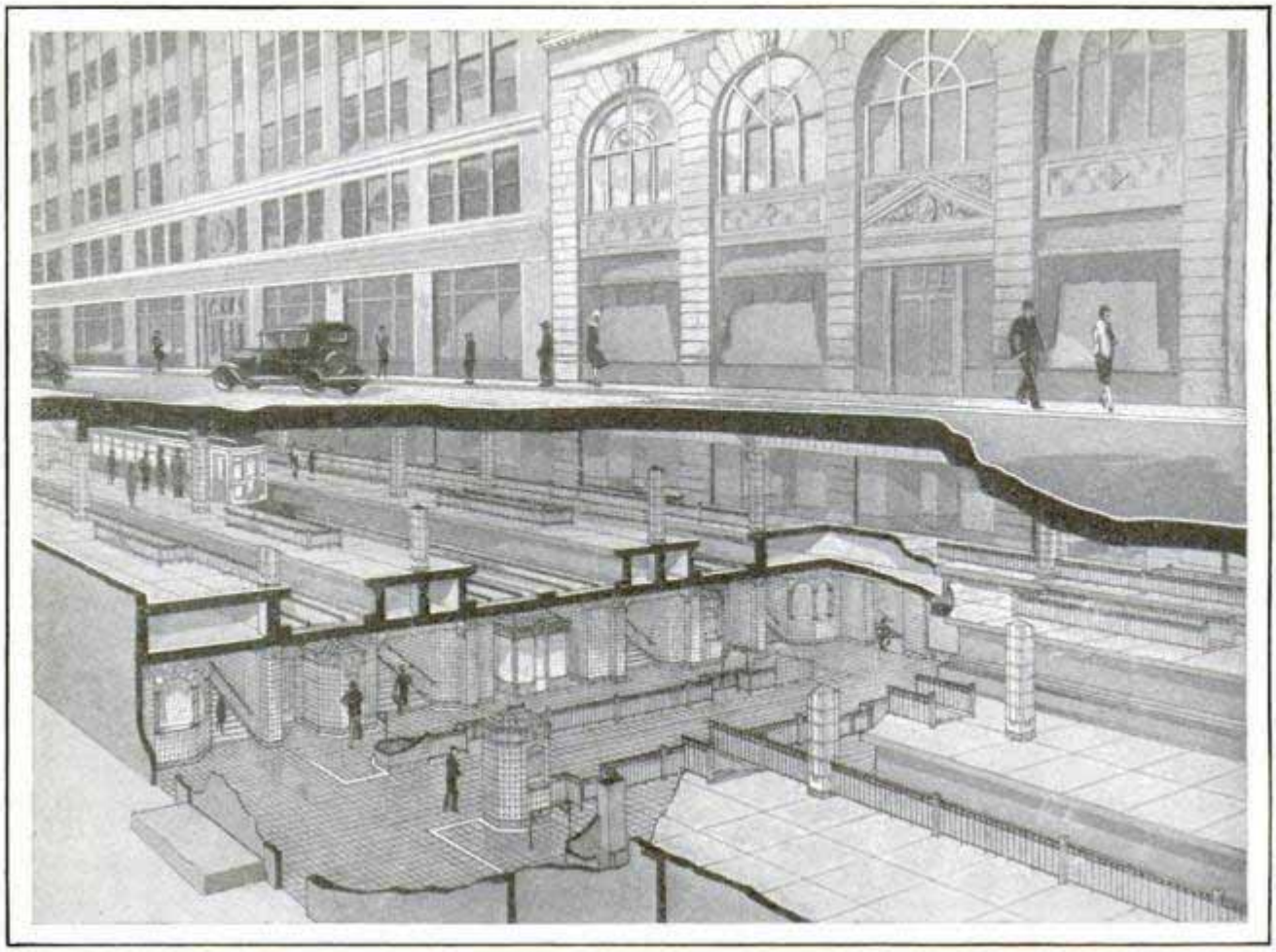
Elimination of the huge airports now required for the safe take-off and landing of an airplane and the minimizing of the danger of fatal accident while traveling by the air route in case the engine of a plane "goes dead," are absolutely essential to the successful progress of commercial aviation, in Mr. Babson's opinion, and will be the outstanding developments to look for in the field of aeronautics in the near future.

But he does not stop there. In fact, some of his predictions as to the future possibilities of other lines of scientific research are even more startling. He visions houses built almost entirely of rubber, lighted by cold light similar to that given off by fireflies and certain fish, and heated in winter and cooled in summer by atomic energy, or some other form of dirt-cheap power derived from sun motors, tide motors or the interior of the earth, and distributed from municipal plants.

Fifty years hence, according to Mr. Babson, the milk bottle will probably be a museum relic, along with the ice wagon, the coal shovel and the ash can, and our milk and butter will be derived from kerosene instead of cows, while most of our other food will be served to us in concentrated or pill form.

By that time wood pulp will be used more extensively than cotton and wool in the making of clothes for both men and women, Mr. Babson maintains, but if one gets an occasional splinter from such clothes there will be many compensations for his wounded feelings, such as television or the sight of distant scenes by radio, for example, and music and color in factories and offices to keep all cheerful.

Furthermore the danger of having one's wooden suit warp out of shape as a result of being soaked by rain will be negligible because Mr. Babson expects that meteorologists will then be able to forecast weather changes weeks in advance and control rainfall by the simple means of pressing a button.



Two-Level Streets May Be Common in the Near Future; in This Plan, Top Surface Is for Automobiles and Pedestrians, with Street Cars and Basement Sidewalks on the Second Level

At first glance, these predictions seem rather fanciful to the layman who gives only casual attention to the progress of scientific investigations. But coming as they do, and in all seriousness, from a man to whom thousands of keen, conservative business men the country over look for counsel, they deserve consideration.

Moreover, Mr. Babson himself says, they are based on a personal critical study of the results of an investigation by his statistical organization to ascertain just what new experiments and developments are being made in various fields of scientific research and to estimate their potential possibilities and ultimate value.

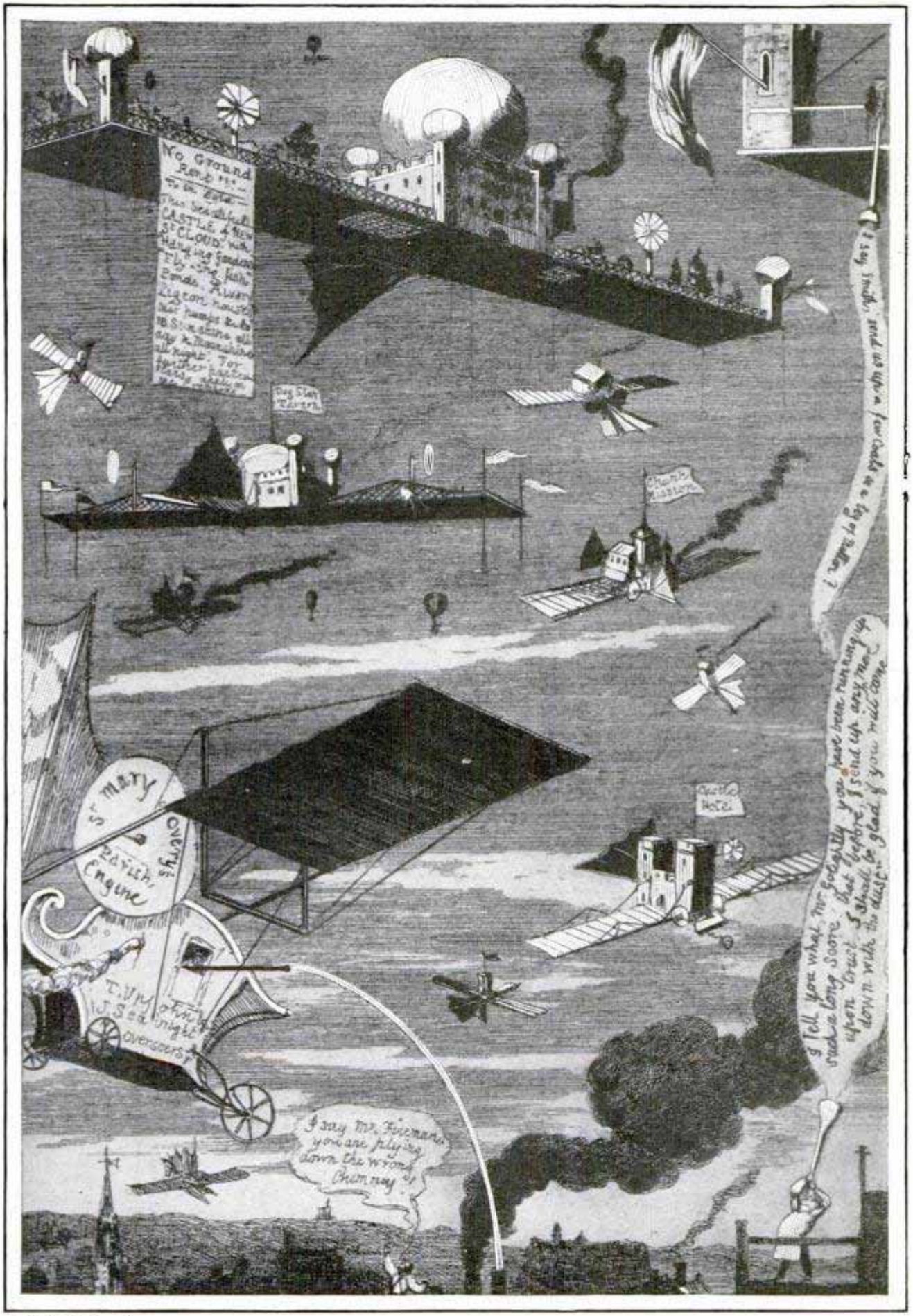
"Cold light is one of the greatest economic needs of the day," he declared, "and, although this is one of the most radical of all inventions being studied at the present time, important and promising work has been done on it during the past year.

"Electricity is only five per cent efficient for lighting purposes today because ninety-five per cent of the energy required to produce a light is wasted in useless heat, but a form of cold light similar to that of the firefly, when it comes, will give twenty times the present light for the same price per kilowatt-hour."

Calling attention to the efforts that scientists are making to tap new sources of heat and power, Mr. Babson stated that he has reports from Italy showing that a factory there is now being run by power from the inside of the earth which comes to the surface in the form of steam and gases. Science has also succeeded in harnessing and utilizing a fraction of the power generated by tidal action, and is constantly seeking ways and means of using the heat from the sun and the energy generated by the revolution of the earth.

"Development of some of these sources of power is to be expected in the next fifty years," he continued, "but they will be insignificant compared with the discovery of how to make radium or use atomic energy. The man who discovers how to make radium will revolutionize industry beyond human dreams.

"For some years now many of the



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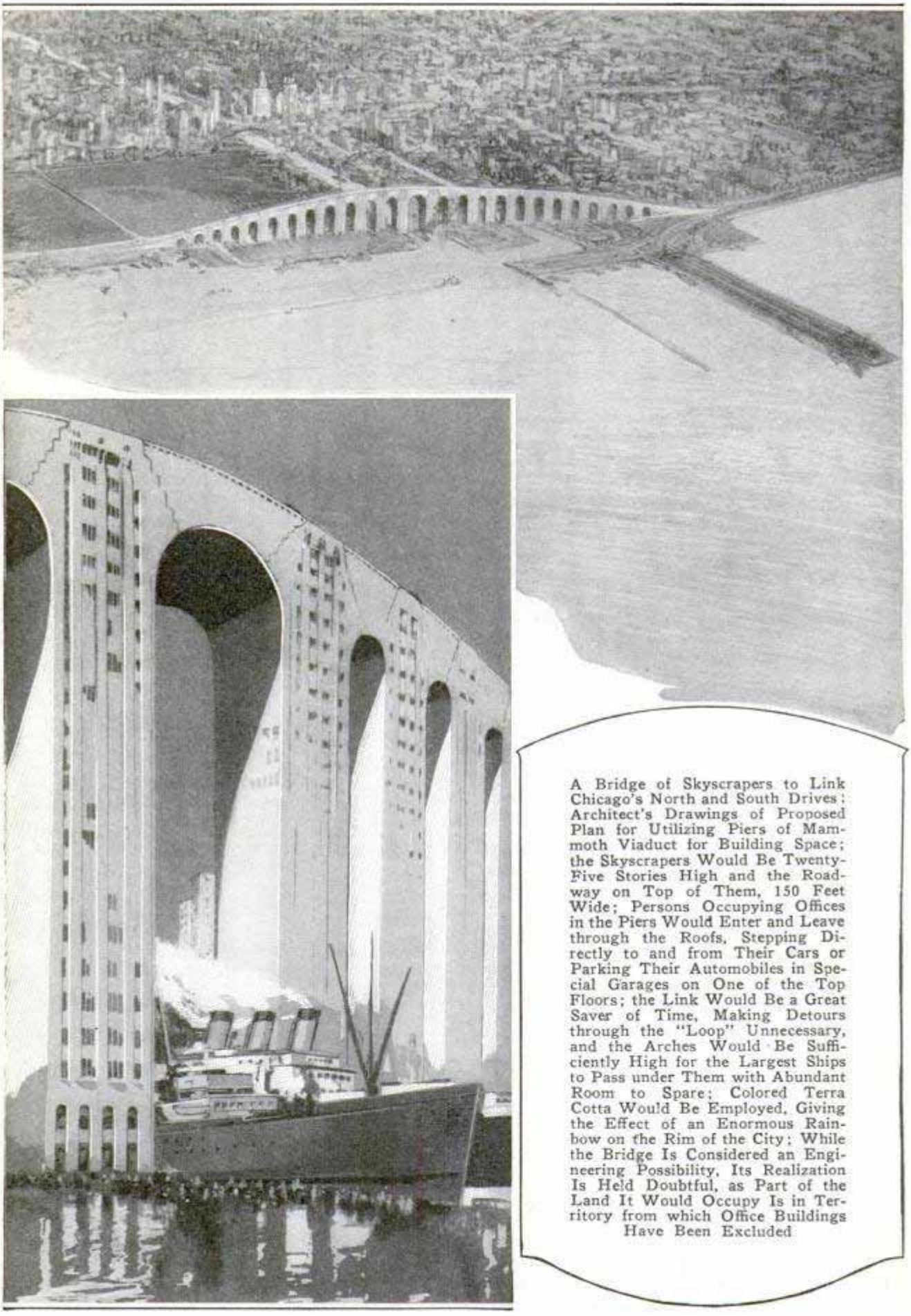
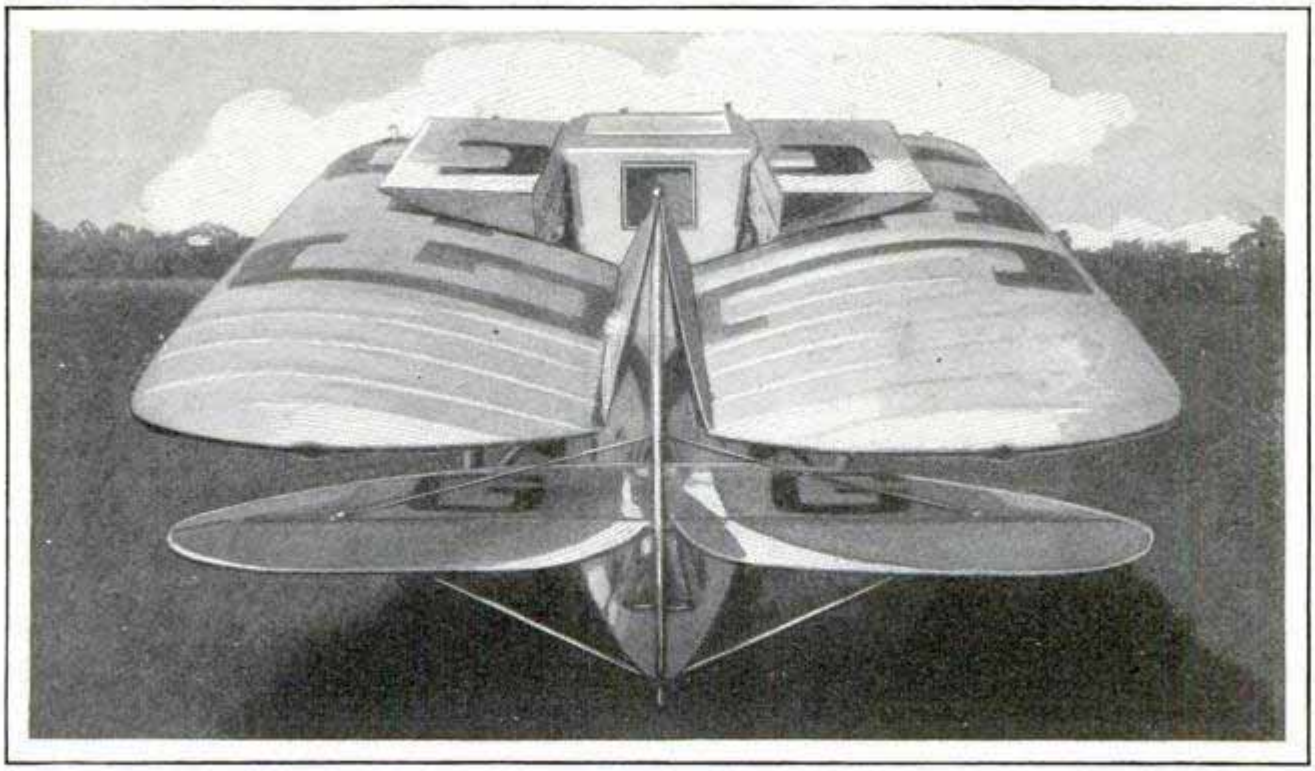
How the Artist George Cruikshank Visioned Aerial Traffic of the Future in 1840; to a Degree Some of His Prophecies, Although Ridiculous Then, Have Come True



A Bridge of Skyscrapers to Link Chicago's North and South Drives: Architect's Drawings of Proposed Plan for Utilizing Piers of Mammoth Viaduct for Building Space; the Skyscrapers Would Be Twenty-Five Stories High and the Roadway on Top of Them, 150 Feet Wide; Persons Occupying Offices in the Piers Would Enter and Leave through the Roofs, Stepping Directly to and from Their Cars or Parking Their Automobiles in Special Garages on One of the Top Floors; the Link Would Be a Great Saver of Time, Making Detours through the "Loop" Unnecessary, and the Arches Would Be Sufficiently High for the Largest Ships to Pass under Them with Abundant Room to Spare; Colored Terra Cotta Would Be Employed, Giving the Effect of an Enormous Rainbow on the Rim of the City; While the Bridge Is Considered an Engineering Possibility, Its Realization Is Held Doubtful, as Part of the Land It Would Occupy Is in Territory from which Office Buildings Have Been Excluded

world's greatest scientists have been studying the structure of the atom, and when they learn the secret of how to release and control the tremendous store



Folding Airplane Wings Permit Housing the Craft in Much Smaller Space Than Is Required by the Full-Spread Ship; This Is a Fairchild Cabin Plane with Folding Wings

of energy that they know is locked up in it, the householder will no longer have to worry through the winter over coal bills or coal strikes.

"Instead of shoveling coal into his furnace, all he will have to do is to take a medicine dropper, and with a drop or two of atomic energy derived from water, he will be able to 'fire up' for a week.

"In practice, however, he won't even do this, for when power can be developed so easily and cheaply, it will be broadcast free of charge for heating and lighting purposes from atomic-energy plants.

"In this connection I see no chance of broadcasting power by radio until some new source of cheap power is developed. I know it is being done in laboratory experiments, but the expense of radio transmission on a large scale is prohibitive at the present cost of producing energy."

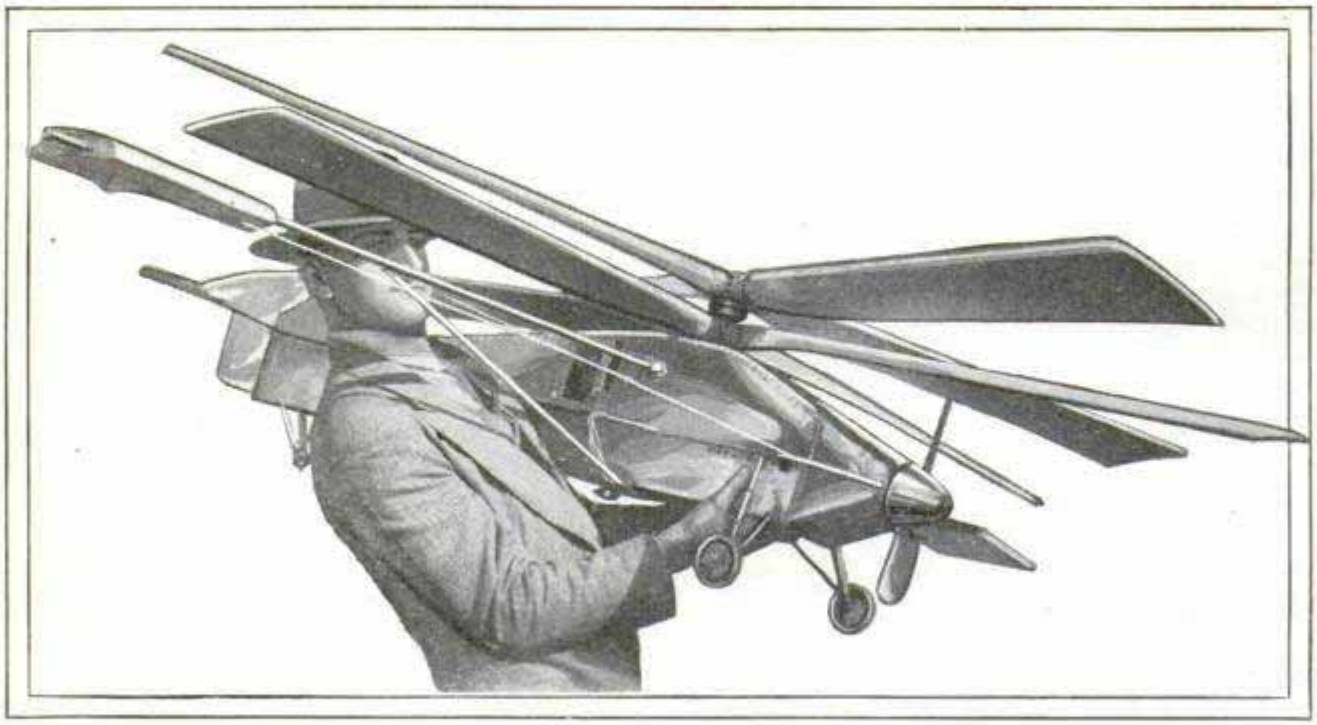
After a source of cheap power is discovered, it will not be long, according to Mr. Babson, until the principal buildings in big cities will be constructed without windows and yet the lighting, ventilation and heating will be better than today.

Referring to the new sources of rubber supply that are being developed, the experiments seeking to produce it synthetically, and to the tremendous increase in the use of it for various purposes, Mr. Babson predicted that in the next fifty years it will become the chief road-building material and will be extensively used as flooring for homes and for lining of office walls.

Flexible glass is now available, he pointed out, but it will in turn give way to unbreakable glass. Alloys will produce metals that won't rust and chemicals will prevent wood from decaying. But there remains the need, for the immediate future, of a substitute for gasoline as a fuel for automobiles. Artificial refrigeration is already putting the ice man out of business, he declared, and he foresees the doom of the electric car for transportation purposes everywhere except underground or on elevated structures.

Basing the idea on the advancement of meteorology in the past few years, and particularly on the discoveries that Abbot and Clayton have made as to how sunspots and variations in solar temperature affect our weather, Mr. Babson declared that long-range weather forecasting should be an accomplished fact within less than fifty years, and it may be possible to make rain or disperse storm clouds or fogs simply by the pressure of a button controlling devices that will set up the necessary disturbances in the atmosphere.

While he regards the airplane as the



As Aircraft Development Goes Forward, the Question of Vertical Ascents and Descents Becomes Increasingly Important; Here Is Valentine Newbauer with Model of "New Era" Plane, to Answer the Problem

greatest scientific development of the present age, Mr. Babson claims that it is still in the experimental stage.

"As I see it," he said, "the airplane industry today is just where the railroad business was when it was thought cog wheels and cog rails were necessary to give the engine traction.

"Of course, the airplane people will tell you that statistics prove that more people die in bed than in airplane accidents, but the fact remains that it took us some time to get over the fear of riding in an automobile, and we have yet to get over our instinctive fear of going up in the air.

"How then are we going to assure people of safety while traveling in airplanes? It seems to me that the only sensible way to do this is to run airplanes in trains. I have a theory that if five or six planes, all operating synchronously, could be linked up in a line, say, at a distance of fifty to a hundred feet apart, then, if one of the engines should go 'dead,' the others would be able to support its weight until the whole train could make a safe landing.

"Running airplanes in trains would reduce the cost of transportation per passenger, and would, I believe, make travel by airplane fully as safe as travel by train, and cheaper and faster."

PROVING GROUND FOR CASTERS PROMOTES BETTER TRUCKS

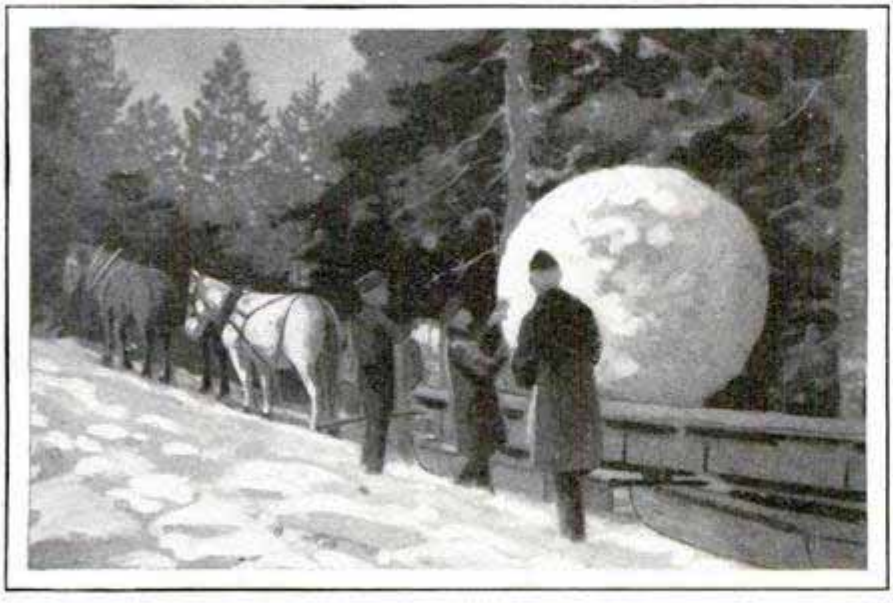
Following the methods of automobile builders in testing their products under actual working conditions, the manufacturers of a brand of casters and trucks have introduced an efficient proving platform where units are subjected to a wide variety of trials. It is simply a circular concrete platform with holes and bumps in it, and the truck, loaded with varying weights, is rolled around it repeatedly by means of a gear apparatus operated by a small electric motor. At the end of a "run," the casters are carefully examined for signs of wear. Since almost any conditions can be duplicated with the outfit and exact results obtained, the apparatus has been found of great aid in preparing a better product.

Testing Platform for Hand-Truck Casters; a Motor Furnishes the Motive Power for Runs under Load

CASTING GLASS DISK FOR BIG TELESCOPE TRIUMPH FOR U. S.

Viewing the Largest Optical Disk Ever Cast in America When Months of Waiting Were Ended and the Furnace Opened

Scientists experienced a tense moment at the bureau of standards a few weeks ago, when they gathered to watch the lid taken off a huge mold where a big piece of glass had been slowly cooling for the manufacture of a lens for a telescope. The chunk measured seventy inches across and eleven inches thick, and weighed 3,500 pounds. It was the biggest piece of optical glass of its kind successfully cast in the United States. The least imperfection would have meant failure for the task that took months of time and unmeasured anxiety from those who had the work in charge. To prepare the lens, 1,000 pounds of broken glass, 4,600 pounds of sand and chemicals were poured into a pot and melted in a gas-fired furnace. When the mass was molten, it was stirred by hand for six hours and then run into an electrically controlled mold at a temperature of 2,400 degrees Fahrenheit. For nine months, the mass was allowed to cool, the temperature being reduced gradually, at certain periods as slowly as four and one-half degrees a day. Experts have pronounced the piece the most nearly perfect specimen of its weight and size in the world, and its casting is regarded as a triumph for a new process developed by A. N. Finn, a scientist at the bureau. The chunk will be used to make a large mirror for the telescope at Ohio Wesleyan university.



Delivering an Imitation Snowball in Which a Movie Actor, Entering through a Trapdoor, Was Rolled down a Hill

MOVIE MAN ROLLS DOWNHILL IN SNOWBALL

Rolling snowballs is usually child's play, but skilled craftsmen were required to fashion an imitation snow sphere for a motion picture. It had to be constructed so that an actor could enter it through a trapdoor and ride safely down a hill while so concealed. The ball was made of metal, wire and plaster of paris. It was six feet in diameter and very heavy.

PROPELLER DRIVES MOTOR SLED AT HIGH SPEED

Aided by a Strong, Favorable Wind, Propeller Iceboat of This Type Has Reached a Speed of Nearly 150 Miles an Hour; the Passenger Compartment Is Comfortably Furnished

Speed approaching that of army-pursuit planes has been attained on the ice under favorable conditions, with a propeller-driven motor sleigh a Michigan enthusiast has constructed. It is equipped with a nine-cylinder motor, is fifteen feet long, carries six persons in a comfortably upholstered body and is especially efficient as it is streamlined to reduce resistance. To stop the craft, a cast-iron spiked shoe is forced down into the ice by a lever at the driver's side. Because of varying wind conditions, exact computation of the speeds attained has been difficult, but, when the sleigh is going with a strong breeze, it is thought that a rate of nearly 150 miles an hour has been reached.

DETACHABLE HEAD ON BROOM AIDS CLEAN SWEEPING

Push Broom with Detachable Bristles, Showing How the Head Is Fastened and Released

When the bristles on a push broom become worn on one side, the head may be taken off and turned around or a new one substituted. The adjustment is quickly made and the head fits securely to the holder. The arrangement not only makes the broom more efficient but reduces waste.

URGE BEAVER CULTURE FOR FUR AND TO CURB FLOODS

Beaver raising is being encouraged by the department of agriculture as a source of valuable fur and to help in flood prevention. Experiments already show that the animals can be successfully grown under semidomestic conditions, that they are easily tamed and also increase more rapidly than in wild surroundings, even under control and protection. It is pointed out that many acres of land now unused could be adapted to beaver cultivation. On timber land that has been cut over, there is a sufficiently large later growth to support the animals, and the dams they build would help reduce floods and provide a water supply for the dry seasons. The damage the animals did in the past by felling valuable trees and flooding low lands, could be overcome in the future by proper fencing and trapping.

STEAM SHOVEL SPEEDS MAIL OVER MOUNTAIN ROAD

It takes a serious obstacle to prevent the mails from being delivered, and this is well illustrated on a rural route out of Glenwood Springs, Colo. The highway had been closed to ordinary traffic by construction work, but the big steam shovel on the job picked up the mail carrier's car, swung it around the digging and deposited it safely on the other side.

Where the Mail Goes Around with the Steam Shovel; Swinging Carrier's Car Past Repair Obstruction

Table Board in Cockpit of Airplane for Writing or for Holding Maps and Paper

FLYING BUSINESS OFFICE AIDS WAR SECRETARY

While on flights in a recently introduced type of plane, Assistant Secretary of War Trubee Davison can do some of his office work, for there is a sliding desk in the cockpit. It does not interfere with the operation of the "joystick" and is useful for holding maps and other papers.

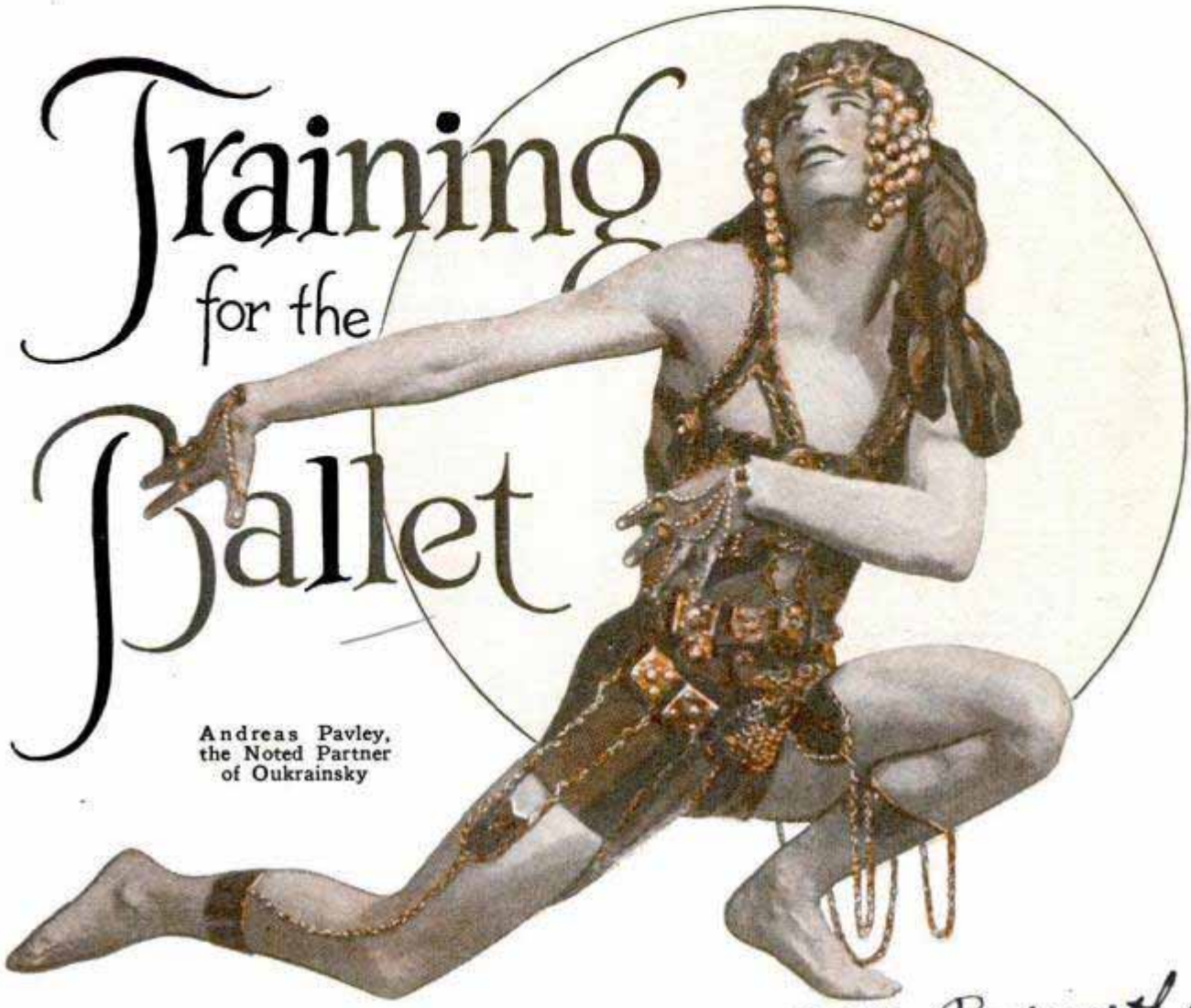
X-RAYS TURN DARK MICE WHITE AND POTATOES BLACK

The hair of mice turns white under sufficient exposure to the X-rays, while potatoes become black, according to the report of Dr. Robert T. Hance of the University of Pittsburgh upon experiments he has conducted with the rays with a view to discovering what further benefits might be derived from them for mankind. He declared that the cause of the color change of the hair lies in the destruction of the organ which furnishes the pigment. At first the hair of dark mice became darker but finally fell out and was replaced with white. The change appeared to be permanent, as no colored hair grew out on mice turned white.

Scene from the Pavley-Oukrainsky Ballet in One of the Numbers of "Samson and Delilah," Presented by the Famous Masters with the Chicago Company; Practically All Their Ballet Girls Are Chicagoans Whom They Have Trained

3398

Training for the Ballet



Andreas Pavley, the Noted Partner of Oukrainsky

By VICTOR RUBIN, 6525 Bosworth Ave Chicago

FEW movements of the human body appear so spontaneous and free from muscular exertion as those of the classical or ballet dancer. Only the swoop of a bird or the leap of a greyhound can be compared with them in the impression they give of utter ease.

Yet, as a matter of fact, there is just as much physical energy expended in performing a ballet—minute for minute—as in playing football. And if one is not in perfect condition, there is almost as much chance of injury.

Likewise, every seemingly impromptu step, every kick, every leap, every twist of body and sweep of arms has been carefully worked out and practiced over and over again with far greater thoroughness than any football player devotes to the execution of his formations.

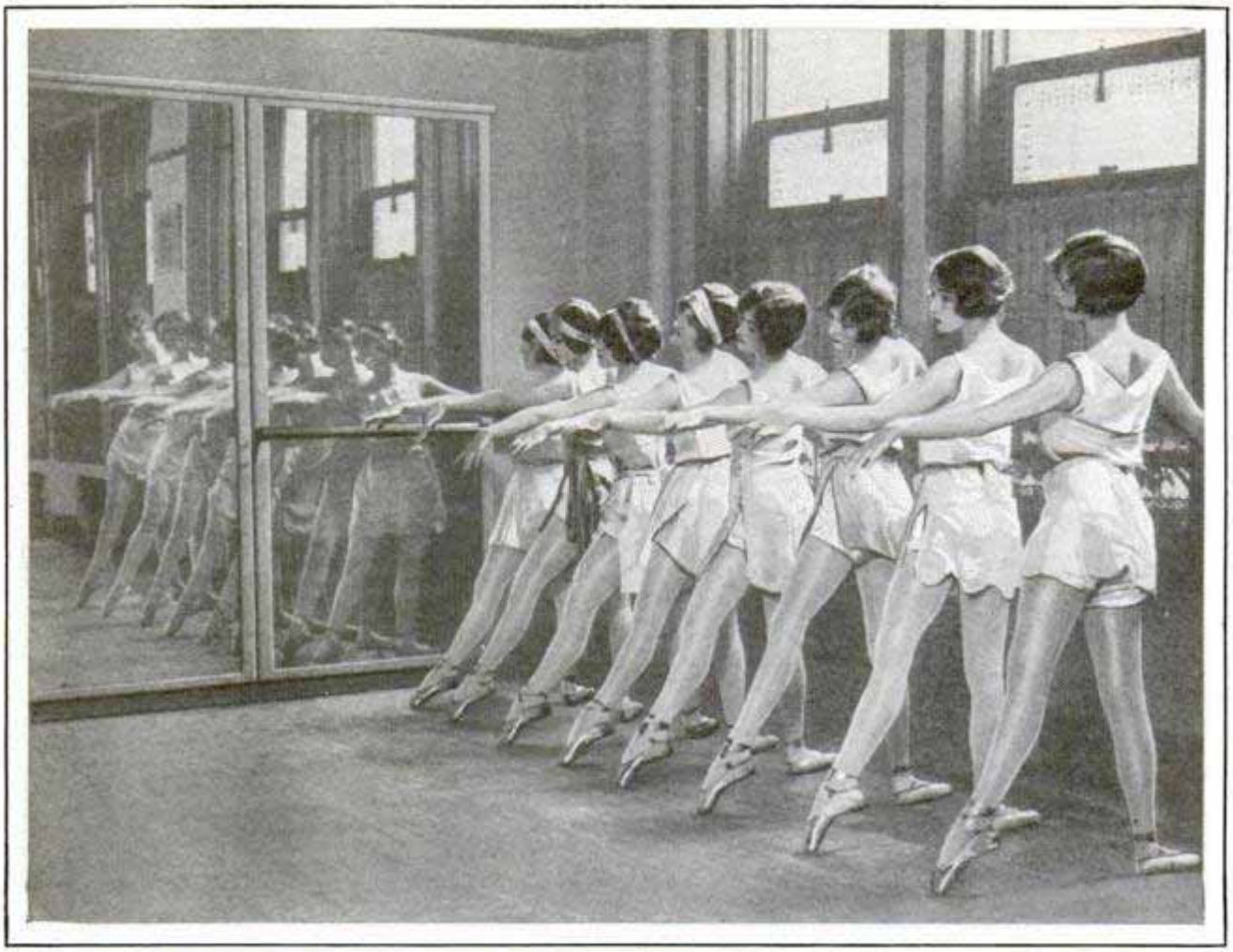
To accomplish those carefree bounds and leaps across the stage—even to hold those graceful postures—requires years of strenuous training under skillful direction.

At least so says Serge Oukrainsky, trainer of ballet dancers. Without such training, he says, the human frame could not stand the tremendous strain thrown upon it. The untrained novice would not merely perform the various evolutions of the dance most awkwardly, but would perhaps tear tendons and ligaments in attempting the most elementary bend, displace joints or, conceivably, break bones.

"Every year I train about 600 pupils. They range in age from little tots of four and five years to women in the thirties. What is the best age to take up dancing? I have found it to be fifteen or sixteen. At that time of life, one's bones and muscles are still supple. Yet one's mind is sufficiently developed to appreciate the forms of art and to understand enough of life, which, after all, is what dancing should seek to express.

"Starting at fifteen, one may become a

64 E Jackson Blvd Chicago



Members of a Ballet School, Drilling before the Mirror-Covered Wall, in One of the Simpler Exercises Used to Attain Suppleness and the Graceful Dance Movements

finished artist by eighteen—that is if one already has the necessary physical and mental attributes. While those starting as children unquestionably gain a better physical and technical foundation, they are too young to express the emotions that are dramatized in the dance. And no matter how early they start and how proficient they become mechanically, they rarely develop into real interpreters before they reach eighteen.

"Where do the dancers come from? From all walks of life and from every social level. But, with few exceptions, they are from the cities and from homes where they have had an opportunity to study music and art. And all are of more than average intelligence and ambition.

"Most are school girls, but many are stenographers, clerks and school-teachers. Often they work hard all day at some uncongenial task in some office, and find in dancing the physical release that we all need, to preserve our health and vigor, both physical and mental.

"To them the world of the ballet, which they have viewed from a seat in the theater, means romance—and perhaps a career. And too often they fail to realize that only the hardest kind of physical work, carried on day after day, will lead them to their goal.

"Not everyone who comes here can become a dancer. One must conform to a certain physical type. He must 'point outward.' I mean toe out naturally, his feet must be high-arched, his arms held in relaxed curves. Charlie Chaplin's figure—loose, toes out—expresses it exactly. Charlie has the perfect dancer's physique."

M. Oukrainsky rose gracefully to his feet and illustrated.

"Then, if one has the dancer's physique, he may fit for either classic or floor dancing. These are two entirely different forms, and a person who excels in one cannot excel in the other.

"For classic dancing one must have long, slender muscles. For floor dancing, such as the squatting Cossack dances, one must

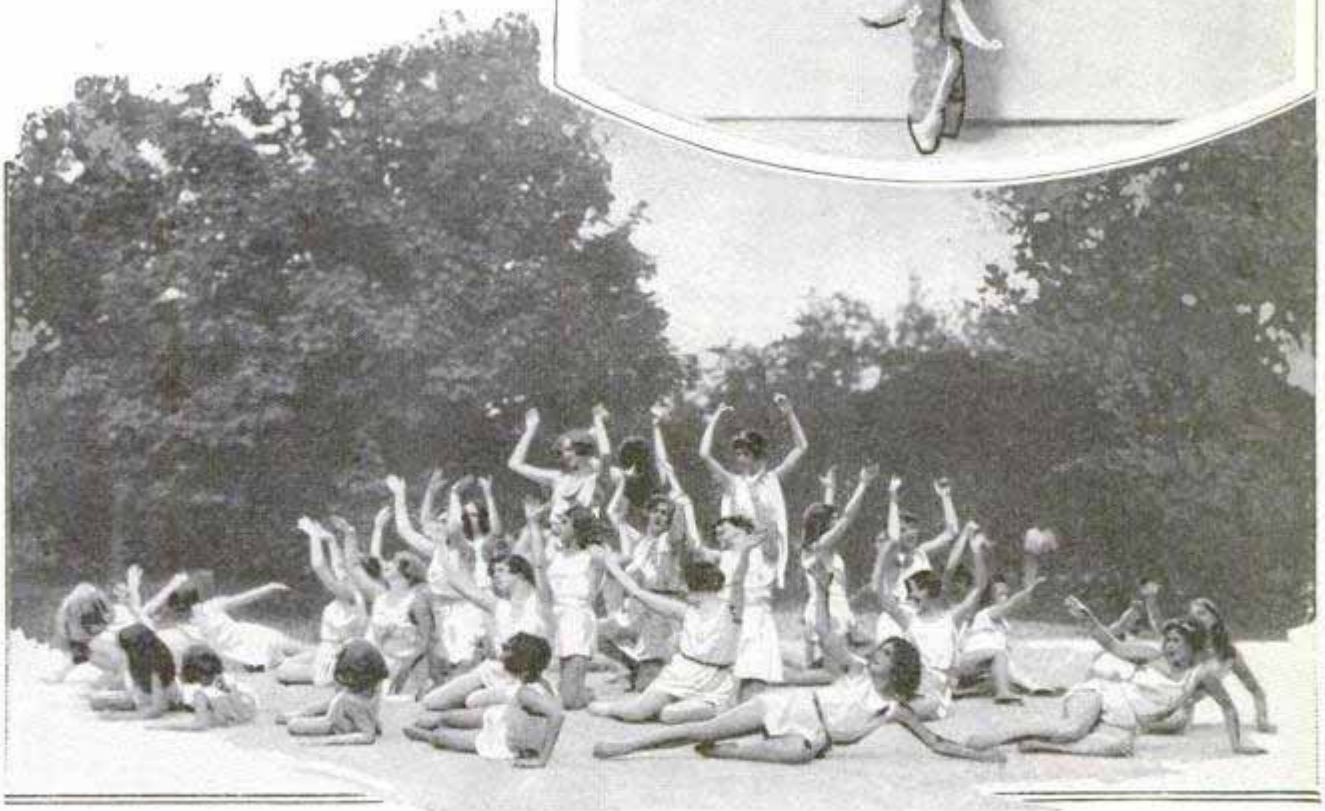
be heavily muscled, and, preferably, short."

M. Oukrainsky led the way to the room in which he gives his instruction. One end is completely covered with a mirror in which the pupils watch their own efforts. Along the other three sides runs a wooden rail about waist-high. To this, Oukrainsky explained, the pupils hold as they practice their bending and twisting exercises.

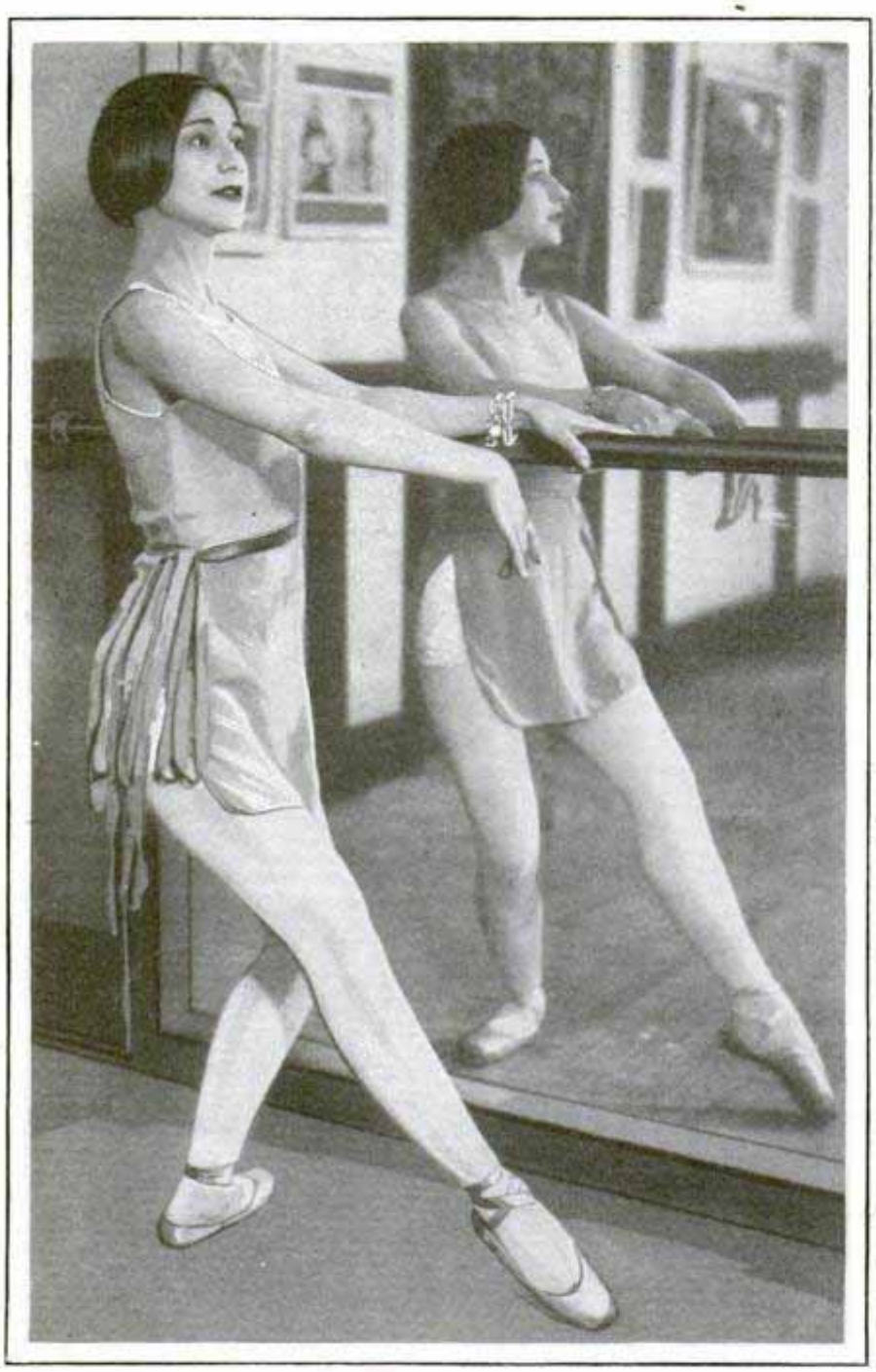
"Training for the ballet means as hard a course of training as any athlete undergoes," Oukrainsky went on. "Every muscle must be developed. The only difference between the training one gets here and in the ordinary gymnasium is that form and agility are as important as strength.

"In dancing, for instance, there must be no angles—except in Egyptian dances. There must be complete relaxation above the waist, no matter how great the muscular exertion. And the whole body must work together."

Attired in the sheerest of cos-



Serge Oukrainsky, Masked and Costumed as a Pagan God of Many Arms Holding Symbolical Ornaments, and a Class of Ballet Pupils Drilling on the Sands beside Lake Michigan



A Bar to Hold to and a Mirror to Watch One's Steps Are the Chief Training "Props" of the Ballet

tumes, the neophyte begins his training by practicing bends at the rail, holding on to the rail with his hands and bending in such a way that the knee is over the ball of the foot. After this has been done over and over again, come the twists, with the knees still bent—difficult exercises for the abdominal muscles that must be executed gracefully and without the slightest sign of exertion on the face.

The third set of exercises is in the kicking, with the toe pointed down and with the knee always held over the center of the foot. Then come the exercises in passing the feet, one in front of the other backward and forward with such rapidity that they seem to flicker like shadows. Watching them, one understands why the dancer's feet must toe out. If they didn't, the heel of the forward foot would strike the toes of the other foot in passing it.

Two hours a day for three years the incessant grind goes on. The rest of the day is devoted to the study of music, the history of dancing and of culture.

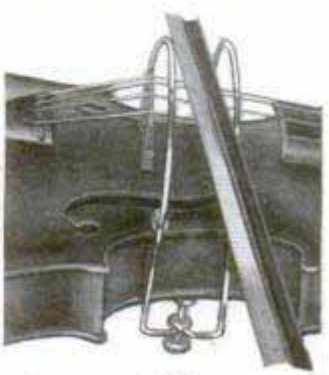
"What peoples make the best dancers?" Oukrainsky was asked.

"The Americans and English and the Russians," he replied. "These have the necessary gift of expression as well as physique. They have understanding, intelligence, strength and agility. But above all, perseverance is needed to become a successful ballet artist."

WIRE GUIDING BOW HELPS BEGINNERS PLAY VIOLIN

23

Many beginners in violin playing have trouble in keeping the bow on the strings at the proper place to insure good tones. This difficulty is said to be overcome with a spring-wire guide that has been patented recently. It is shaped to support the bow regardless of the string that is being played and is held in place with a thumbscrew, bearing on the back. The contact points are covered to prevent scratching.

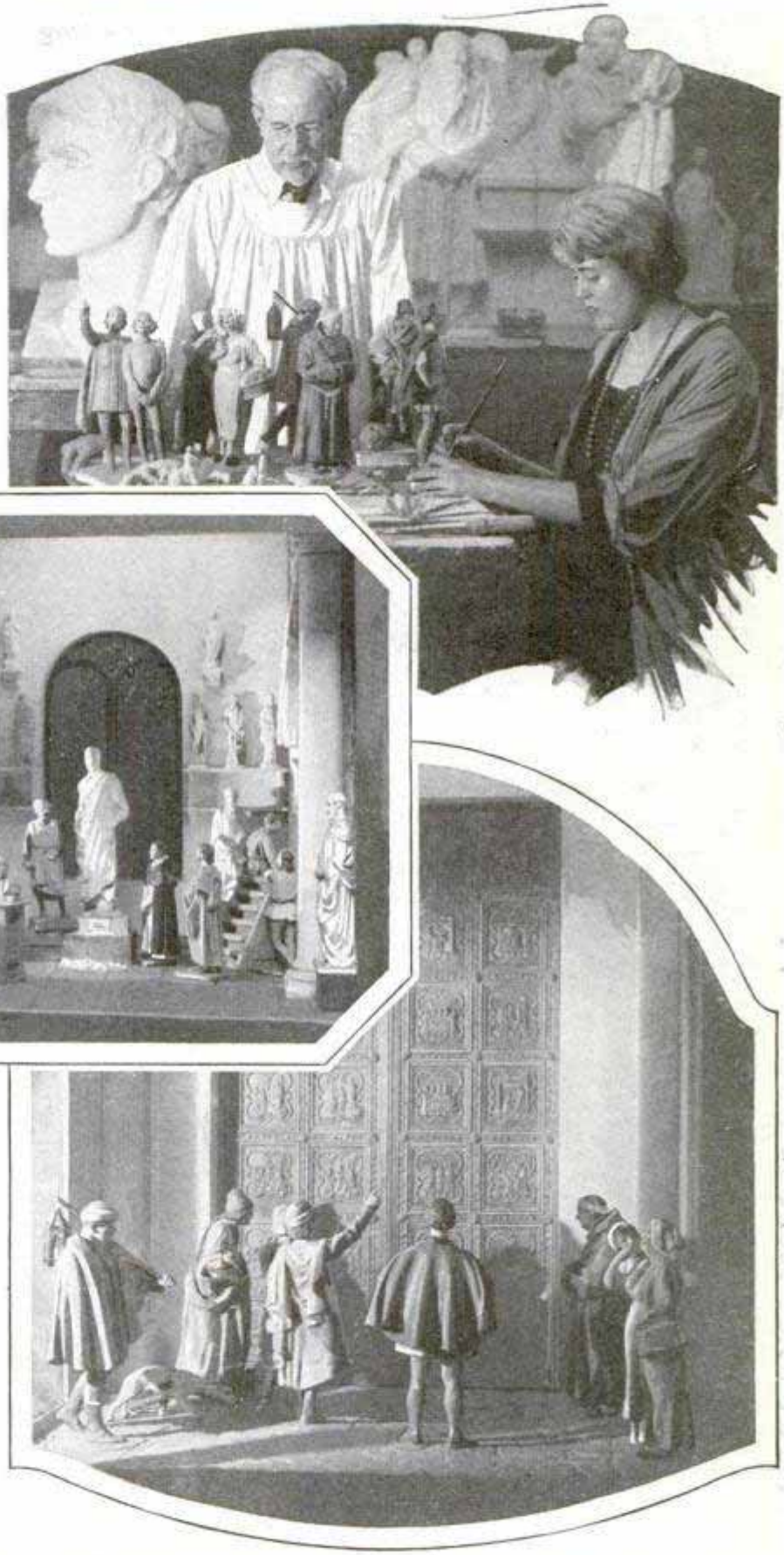


Frank Carver.
1389 Albany Ave.

3847 Mr. Paddock

"PEEP SHOWS" GIVE GLIMPSE OF ARTISTS' LIVES

Glimpses into the lives and works of great artists of the past are afforded in tableau models prepared by Lorado Taft, the sculptor. They are life-like reproductions of actual characters and studio interiors on a small scale and are housed in lighted booths for school or museum use. In the arrangement of details, coloring, costuming and other particulars, great accuracy has been observed so that the displays are helpful as historical references as well as entertaining. One of them shows a morning in Donatello's studio, in 1425. The master is engaged in carving his great figure known as "Il Zuccone" or the "Baldhead," which now decorates the Campanile. His "St. George" and many other well-known works are recognizable. Several of his friends, including Fra Angelico and Cosimo de' Medici have dropped in to see him. Another depicts an interested group before the famous seventeen-foot bronze doors made by Andrea of Pisa for the ancient baptistery in Florence.



Mr. Taft and His Assistant, Miss M. H. Webster, at Work on the Small Figures; a View of the Donatello Studio Group, and, at the Right, Andrea's Doors

The small model in this booth was made by Trygve Rovelstad, who, at the time, was just out of the Elgin, Ill., high school. In the gathering before the doors are Lorenzo Ghiberti, Filippo Brunelleschi and Donatello. The booths are the first of a series Mr. Taft is planning, to present scenes from the history of art in a more vivid and entertaining way than is possible in text books.

TWIN MOTORS ON BUS SIDES GIVE HIGH SPEED

The problem of using street space more economically has resulted in the development of a new type of bus called a twin coach, driven by two engines and having capacity for forty persons and standing room for thirty-five. The new bus resembles a Pullman car in appearance. Curved glass windows at all four corners eliminate the so-called blind spots and make for safer driving and increased observation by the passengers. Persons entering or leaving the new conveyances also are amazed to see the doors swing open automatically, compressed air being used for the purpose. The twin driving units are perhaps the most interesting innovation to the automobile fan. Two fifty-five horespower engines are mounted amidship, one on either side of the bus, each a complete unit with its own radiator, clutch and transmission to one of the rear wheels, and each easily accessible for inspection or repair from both the inside and the outside of the vehicle. These combined engines are capable of driving the busses, which weigh 14,500 pounds without occupants, at a rate of 65 miles per hour and better.

Twin Motor Bus Which Has Two Engines with Controls at Either End and Can Make High Speed with Big Loads

many other novel features. In the new vehicle, all space formerly used for the engine, steering gear and radiator is now used for passengers, affording seating

USE ELECTRIC HEAT TO SPEED OPENING OF FLOWERS

A change in temperature of a degree or two is sufficient to force flowers to open, while more severe applications of heat speed the process, according to F. M. Andrews of Indiana university, who has made a study of the effect of heat on flowers. In his experiments, electricity was used to provide the necessary heat to move the flower segments of crocus and tulip plants. In some cases a resistance wire was wound inside a glass bell jar which could be lowered over the plant, a rheostat being used to vary the temperature. A raise of two degrees, centigrade, was sufficient to open tulips, and a one-degree rise sometimes caused crocus flowers to unfold.

97 General Electric Co, Schenectady, NY
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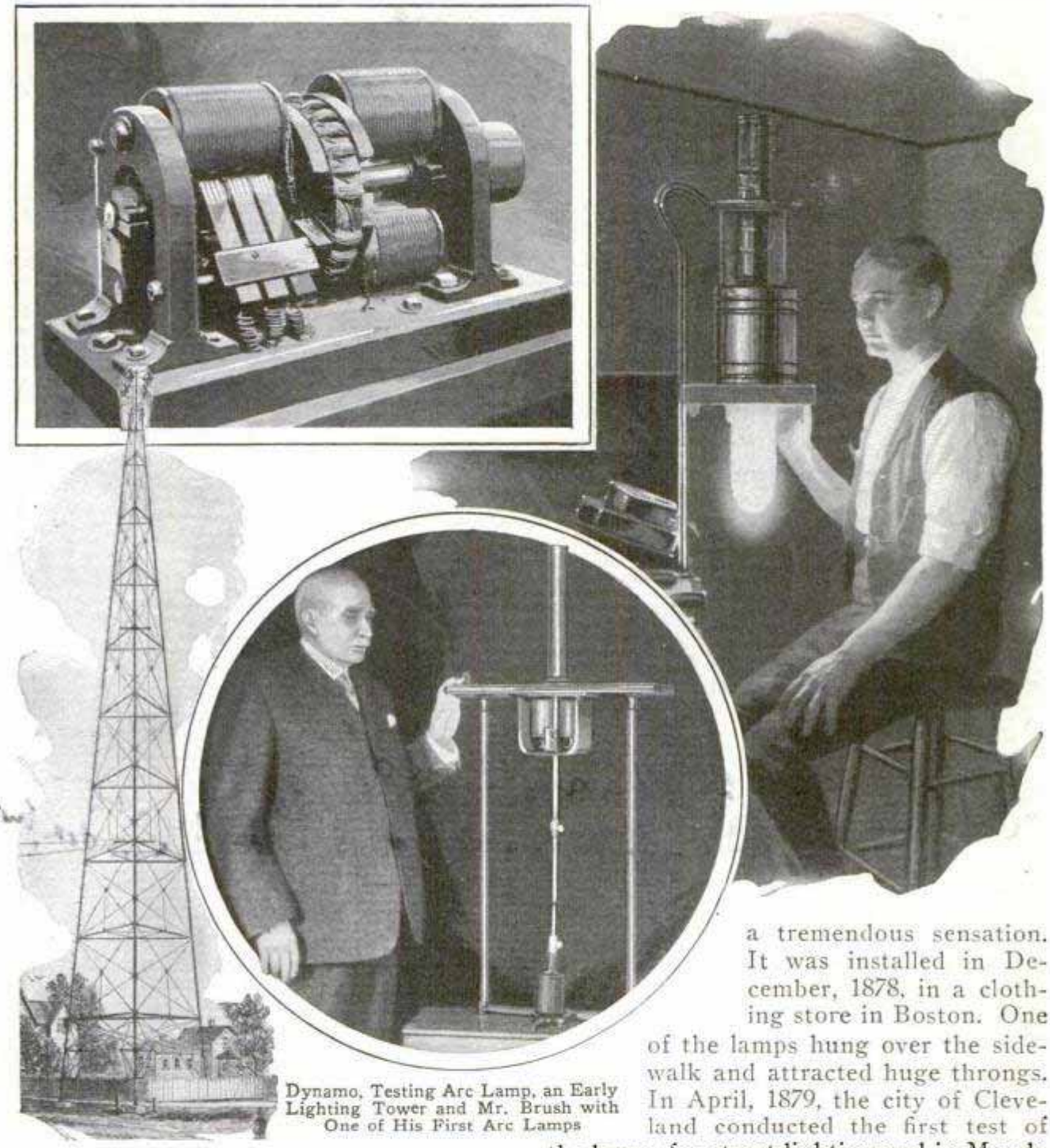
ANNIVERSARY RECALLS ROMANCE OF ARC LIGHT



Dynamo, Testing Arc Lamp, an Early Lighting Tower and Mr. Brush with One of His First Arc Lamps

The fiftieth anniversary of one of the most important events in modern times, the birth of the electric-lighting industry, is to be observed this year. It was in 1878 that Charles F. Brush invented the series arc lamp with its regulating shunt coil, making arc lighting from central stations commercially possible. Edison contributed a climax with the incandescent lamp. These inventions gave a powerful stimulus to development in other fields of electricity. The first electric-light plant proved a tremendous sensation. It was installed in December, 1878, in a clothing store in Boston. One of the lamps hung over the sidewalk and attracted huge throngs. In April, 1879, the city of Cleveland conducted the first test of the lamps for street lighting and in March, 1880, four lamps were hung from the flagstaff of the county courthouse at Wabash, Ind. This marked the first installation of a street-lighting plant by a municipality. When the current was turned on, men fell on their knees in wonder. Farmers were led to believe that the lights would greatly stimulate their crops. No increase was noted, however, but the lights gained favor so rapidly that, by the end of that year, about 6,000 had been installed in various parts of the country.

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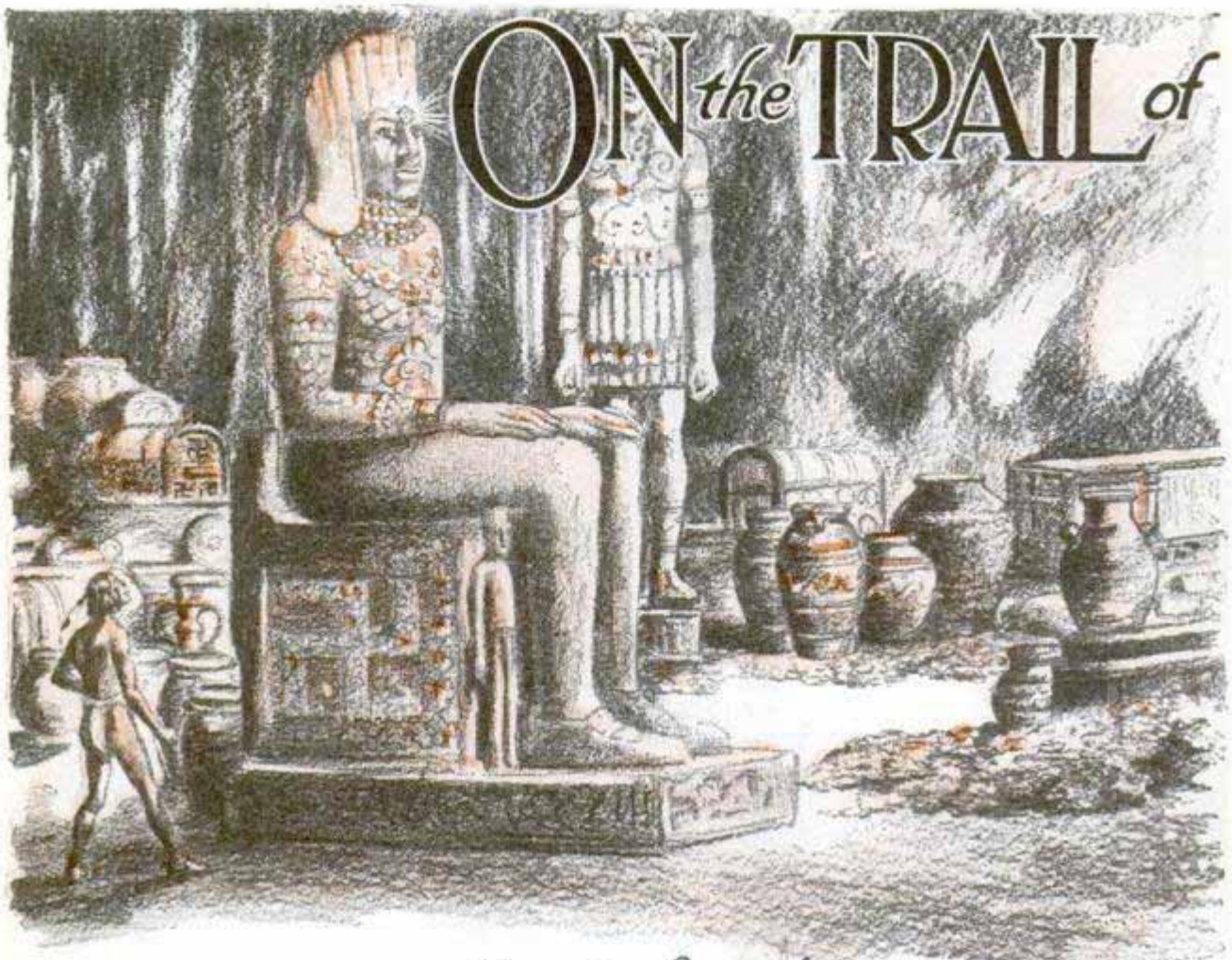
ON the TRAIL of



"Colomberie" 29 Beare Road. Esq.
Barnehurst Road, Bexley Heath
ne London.

By HAROLD T. WILKINS

THE mystery of the treasure alleged to be concealed in a cave of the Santa Clara mountains of Mexico, has occupied the attention of generations of treasure hunters. A wonderful story about this cave of Aladdin came from Mexico City in July, 1926. The director of the National museum in that city was visited at his office by an old Indian who offered to lead him to this mysterious cave. The Indian said that he was a charcoal burner and happened to come upon the treasure while seeking shelter from a storm. Entering a long tunnel, which sloped downward, he suddenly found himself in a cave lighted by a ray of light from the roof. The ray, falling on two huge idols, caused them to shine as the sun, and at first terrified him. It was a large cave, went on the Indian, and filled with golden images and armor of gold set with precious stones.

The Indian left the cave and carefully covered the entrance to prevent its rediscovery. He then journeyed to Mexico City to seek aid. The director could not then join the Indian, and when he sought for him some time later, he found the native had since died. It is known that the Incas of Peru used secret, but very potent, poisons to keep inviolate their hiding places of treasure. The director was so impressed by the Indian's air of sincerity that he arranged an expedition to make a thorough search of the Santa Clara mountains. He commissioned a party of explorers to seek for this cave and selected as their leader Maj. John Gillespie, who served on the staff of the 16th division during the World war, and who is to receive a share of the treasure in case it is found.

According to the Indian's thrilling story, the sun, shafting down on the objects in the hidden cave, struck out rays of dazzling brilliance from two magnificent gems serving as the idol's eyes. All around on

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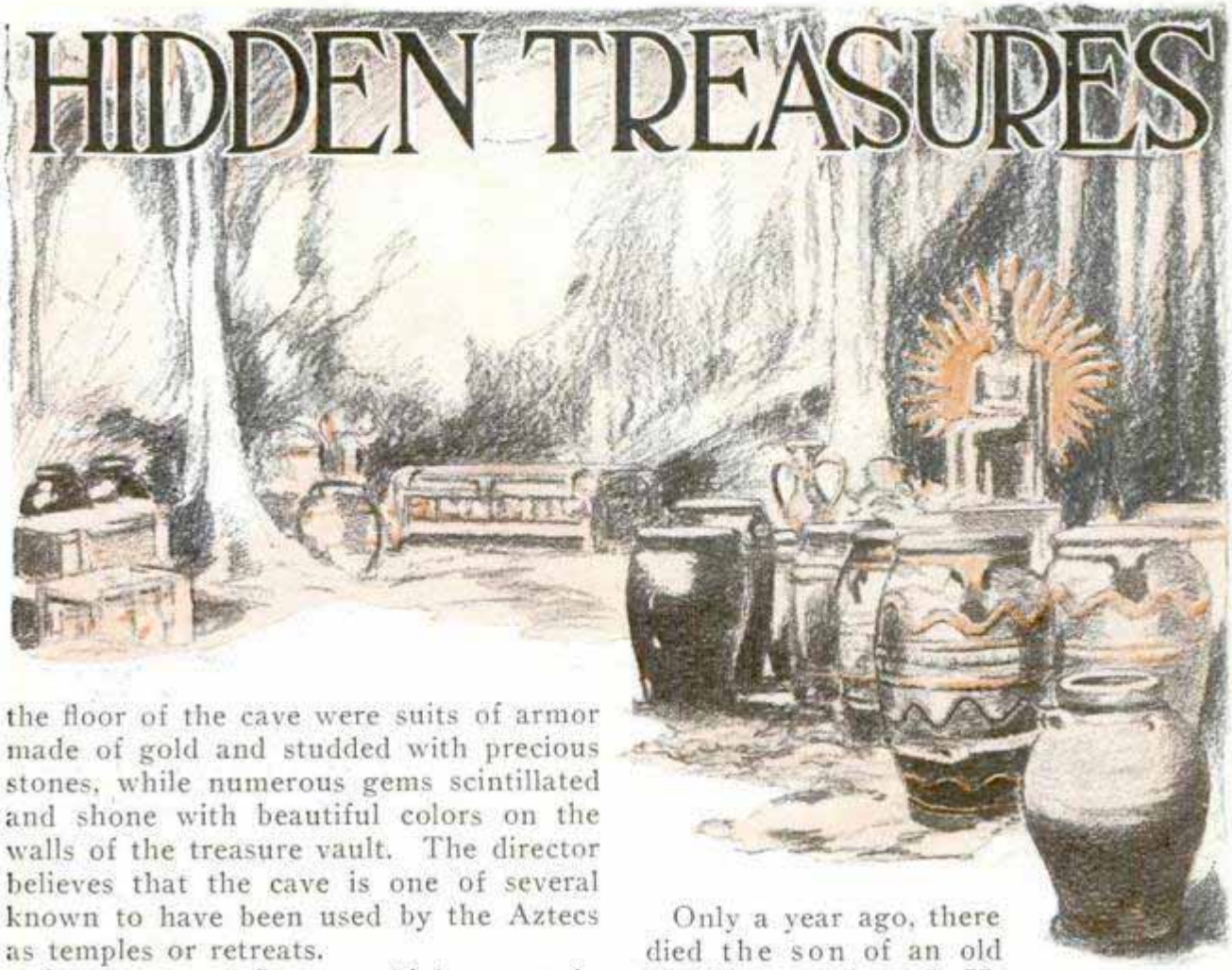
HIDDEN TREASURES



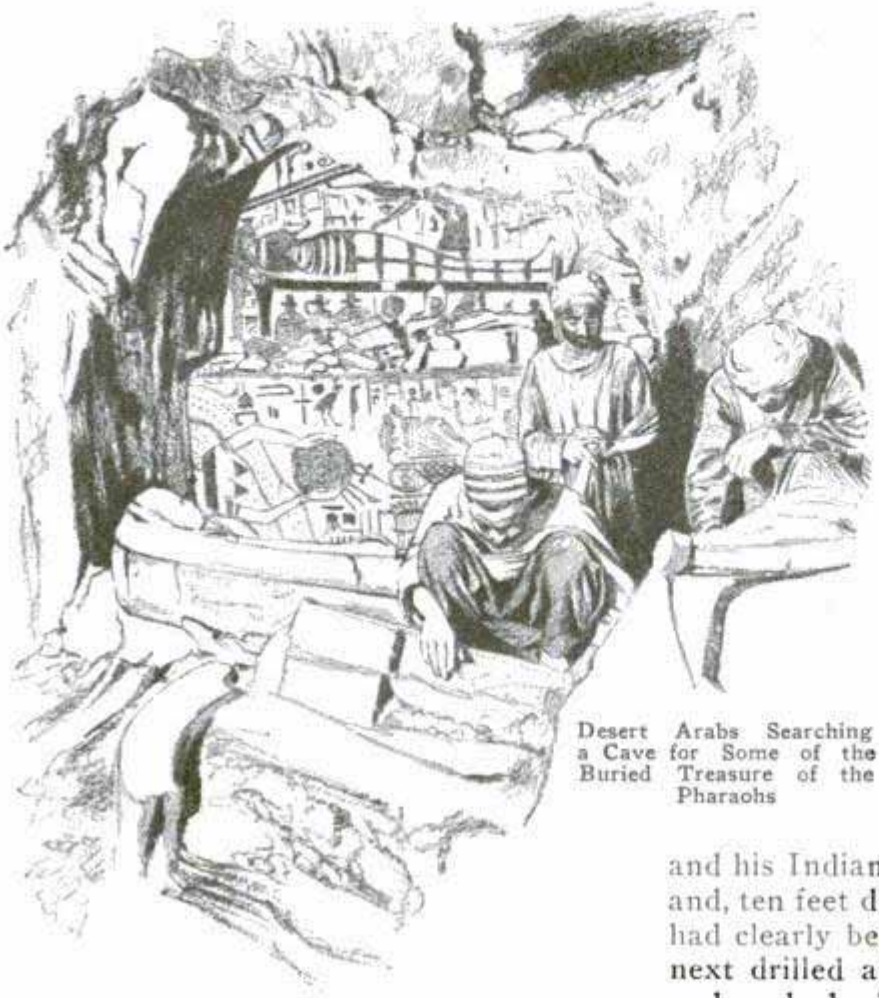
the floor of the cave were suits of armor made of gold and studded with precious stones, while numerous gems scintillated and shone with beautiful colors on the walls of the treasure vault. The director believes that the cave is one of several known to have been used by the Aztecs as temples or retreats.

On the top of Sorata, a high mountain of Bolivia, is a lake in which, says Indian tradition, some of the great Inca treasure was thrown, after the slaying of Emperor Atahualpa by the Spanish under Pizarro. Into this lone lake of Orcos, as it is named, an old chronicle says the Indians threw a chain of gold which stretched round the market place of Cuzco, Peru, for the Incas to grasp at in religious ceremonies. This chain was so big that 200 Indians could scarcely carry it.

The region of Pacachanaca, in northern Peru, contains hoards of hidden treasure. Here lived a highly civilized race, known as the Chimus. They were skilled engineers and spanned great gorges and ravines with aqueducts. The Chimus were conquered by the Incas, about 100 years before the coming of the Spaniard. There is a mysterious city of the dead in this country in which a Spaniard found nearly $4,000,000 worth of gold in a mound called the "Toledo." Somewhere in the labyrinth of walls and concealed passages in this dead city is buried an immense treasure, according to an Indian tradition.

Only a year ago, there died the son of an old English squire, C. H. Prodgers, who had a remarkable career as an explorer and hunter of hidden treasure in the inaccessible regions of South America. He took the keenest interest in tales of treasure caches, and spent a very large sum of money hunting them on the slopes of the Andes. On one of his expeditions, he came across a remarkable document relating to a treasure, buried by the Jesuits. It read: "If you find a steep hill all covered with dense forest, the top of which is flat, with long grass growing, from where you can see the river Sacamhaja on three sides, you will discover on the top of it, in the middle of the long grass, a large stone shaped like an egg, so big that 500 Indians were required to place it there.

"If you dig down underneath this stone for five yards, you will find the roof of a large cave, which it took 500 men two and a half years to hollow out. The roof is seventy yards long, and there are two compartments and a long narrow passage leading from the room, on the east side, to the main entrance 200 yards away.



Desert Arabs Searching a Cave for Some of the Buried Treasure of the Pharaohs

"The door is a large iron one, and inside, on the right, you will find an image made of pure gold, three feet high, the eyes of which are two large diamonds. This image was placed there for the good of mankind. You will find, in the first room, thirty-seven large heaps of gold, in the second room, a large box and thirty-seven big heaps of gold.

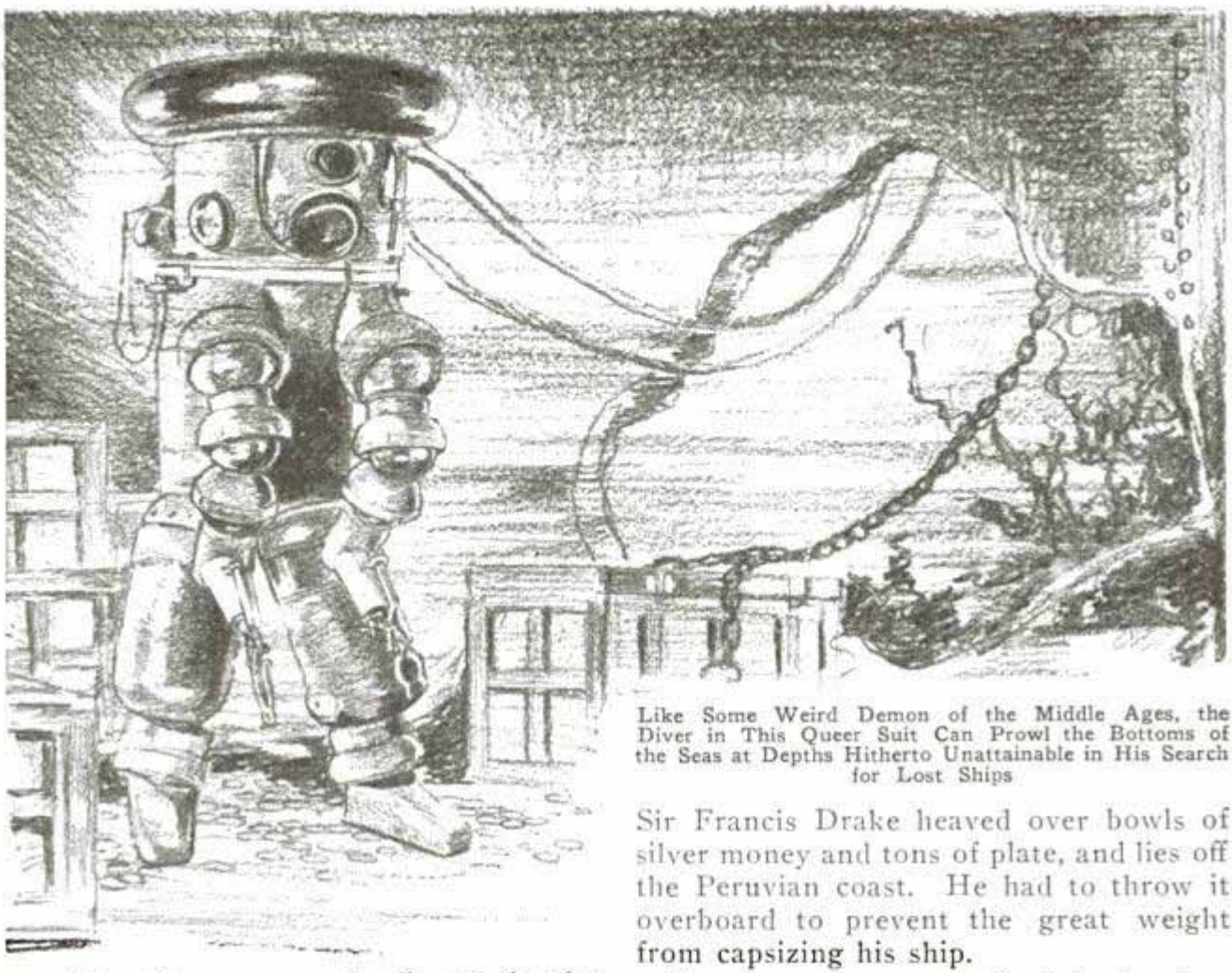
"On entering the second room, you will find, in the right-hand corner, a large box clamped with three iron bars; inside this box is $90,000 in silver money, and thirty-seven big heaps of gold. Distributed in the hollows on either side of the tunnel and the two rooms, are altogether 163 heaps of gold, of which the value has been estimated at $60,000,000.

"Great care must be taken on entering these rooms, as enough poison to kill a regiment has been laid about."

This treasure represents eleven years' accumulated workings of the mines of El Carmen and Tres Titilias, and from the gold and diamond washings carried on, near Santa Cruz, by 2,000 Indians directed by Jesuit fathers. Many expeditions, it may be understood, have been fitted out to search for this rich treasure. The president Malgarejo of Bolivia headed one expedition and another started out from Valparaiso, in 1895; but both failed to find the treasure.

Prodgers found the egg-shaped stone on the top of the hill, and blew it off with dynamite. He then entered the cave but found nothing at the first attempt. Nevertheless, some Indians who were passing the place had dug up silver in a mound near the river, where a previous owner had found $100,000 worth of the metal. At the second attempt, Prodgers and his Indian helpers drilled into the hill, and, ten feet down, came on a cavity which had clearly been made by a mason. They next drilled another hole through a rock and pushed a bamboo pole into the cavity. A horrible smell at once arose, and some of the men, feeling ill, left the cave. Prod-

A Jesuit Father's Map of the Territory Back of the Azangaro Mountains of Peru, Where Fabulous Treasures of the Incas Lie Buried



Like Some Weird Demon of the Middle Ages, the Diver in This Queer Suit Can Prowl the Bottoms of the Seas at Depths Hitherto Unattainable in His Search for Lost Ships

gers himself was so much affected that he had to return to England to recover his health. A third attempt was made in the midst of jaguars, pumas and foxes prowling in the woods around the hill. The Indians were so terrified by the fate of workers in previous years that they would not help, and Prodgers was injured and had to abandon the project for lack of labor to continue it.

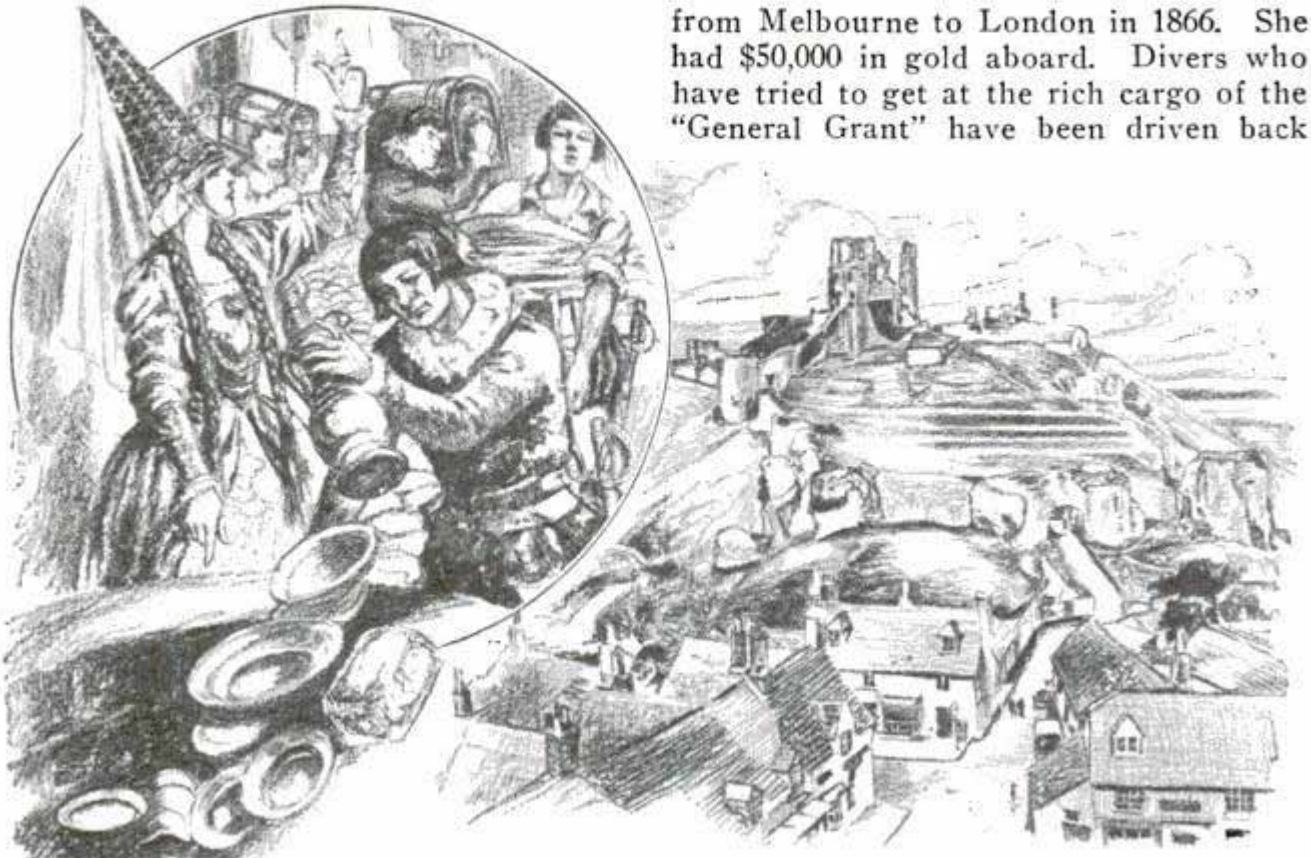
Rich treasure wrecks abound off the South American coast on the west. In the year 1681, a rich treasure ship, bound from Lima to Guayaquil, crashed on a reef named Santa Clara. She was carrying 100,000 pieces of eight and silver plate and ingots.

For more than 280 years, the wreck of a seventy-gun ship, laden with 30,000,000 of Spanish dollars, and consigned by merchants of Lima to King Charles of England, has lain under water, nine miles north-northeast of Point St. Elena.

A steep island, to which there is no landing save by a gully on the northeast side, has excited many longings in the breasts of adventurers since the far-off day when Sir Francis Drake heaved over bowls of silver money and tons of plate, and lies off the Peruvian coast. He had to throw it overboard to prevent the great weight from capsizing his ship.

The numerous romantic islands ringing round the Caribbean sea are the home of the buried-treasure seeker, following on the trail of the buccaneers and pirates, who broke the "Jolly Roger" and the flaming dart and hourglass at their halyard peaks. Cultivators of Tortuga, which lies in the track of the scouting fleets of Uncle Sam's navy, based on Cuba, now and again turn up ancient pieces of eight and doubloons of the seventeenth century in the soil, or find fragments of gold chains and ancient jewelry cast up by the tides on the beaches. There is a haven in this island, called Treasure cove and known to have been used by the old buccaneers of Morgan's days. Somewhere off the Port de la Plata coast of the adjacent island of San Domingo lies an entire table of gold, weighing more than 3,300 pounds. This magic table was being carried by the Spanish governor Bobadilla to the king at Madrid when his ship sank in a hurricane.

Two remarkable treasure wrecks have attracted salvors in African and Australian waters. Lying in a cleft of rocks



The Ruins of Corfe Castle, Dorsetshire, England, in the Deep Well of Which Is Supposed to Lie a Treasure of Silver Plate, Cast There by Order of Lady Bankes, Who Defended the Castle against Cromwell's Army

about thirty yards off a wild coast of boiling breakers and raging surf, is the wreck of the East Indiaman "Grosvenor," which drove ashore in bad weather, off Pondo Land, South Africa. She was carrying $10,000,000 worth of precious stones, bullion and specie, and ivory and a wonderful peacock throne of gold, pearls, rubies and emeralds, from the palace of the Great Mogul, at Delhi, India.

The British admiralty tried to raise the wreck in the eighteenth century, but failed. Then a syndicate, in 1906, hired a dredger from Table bay, and fished up gold and silver coins, a silver brooch and fifteen guns, before bad weather stopped the work. The salvors said the hold and strong room were still intact. In 1920-1922, a new syndicate started to bore a tunnel from the land, which is about 200 yards from the cleft of the rock in which the wreck lies. The wreck still remains unbeaten.

The other rich wreck is that of the "General Grant," an American sailing ship, driven far out of her course by a violent storm, which she met on a voyage from Melbourne to London in 1866. She had $50,000 in gold aboard. Divers who have tried to get at the rich cargo of the "General Grant" have been driven back by raging waves and strong undercurrents.

England has some treasure caches which still remain undiscovered. Corfe castle, Dorsetshire, has a hoard of gold and silver plate at the bottom of a well. Charles I was warring on the English republicans when Lady Bankes of Corfe castle held the fort for him. She put up a plucky fight, but had to surrender. First, how-

Development of the Underwater Cutting Torch Has Opened Up a New Treasure-Hunting Possibility

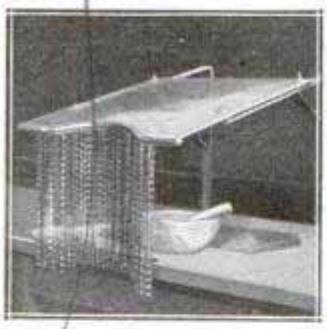
ever, she collected all the gold and silver in the castle and threw it down the deep well. Attempts to raise the treasure have been unsuccessful.

INSTANT HOT-WATER HEATER HELPS SAVE GAS

Suitable for a small installation, such as in a home or office, a water heater now on the market is so adjusted that water and gas are turned on at the same time and the heating is almost instantly accomplished, so that it is not necessary to keep the gas burning long. A pilot light ignites the main flow. A small valve permits regulation of the temperature of the water from lukewarm to boiling, and the heater is said to generate steam within ten seconds after the water has been turned on.

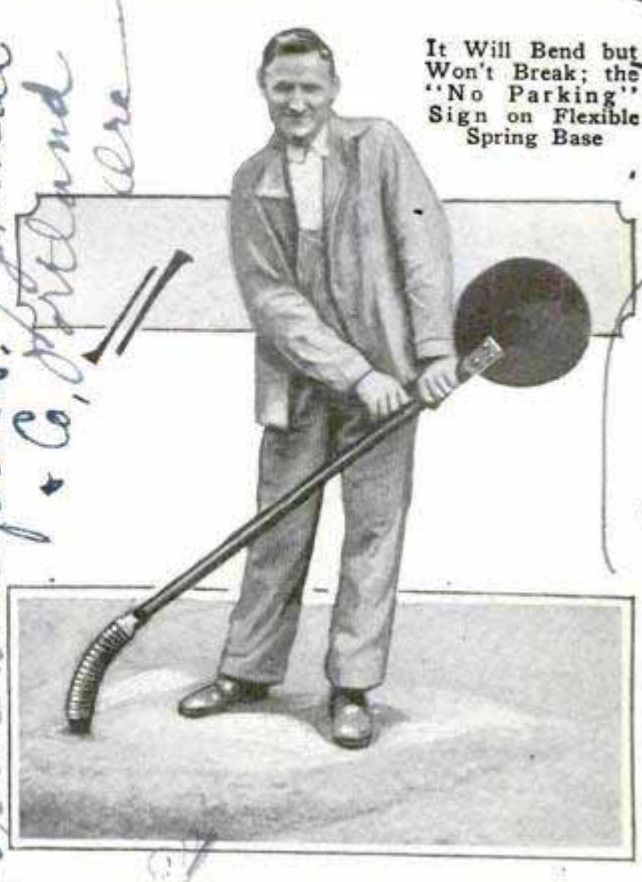
GLASS SHIELD GUARDS CHEMIST FROM EXPLOSIONS

To protect the experimenter with chemicals from fires and explosions, an army officer has devised a glass shield and chain arrangement which is said to be effective. The glass serves both as a protector and as a sort of desk. It is fitted over the pestle or other implement used and has a curved edge against which the operator can stand and so be close to his work. Suspended from the glass are a series of small chains which serve to take up any heat that may be given off or to guard the person from flames.



COLLEGE PAYS HONOR TO MULE IN MEMORIAL TABLET

Trustees of Berea college, Berea, Ky., have authorized the erection of a bronze tablet on a spring house near by, in honor of Rube Baker, a stalwart mountaineer, and "Jenny," his mule. The memorial celebrates the fiftieth anniversary of the completion of a roadside drinking fountain which has proved a source of pleasure and help to thousands of travelers.



It Will Bend but Won't Break; the "No Parking" Sign on Flexible Spring Base

"NO PARKING" SIGN IS FLEXIBLE AND KEEPS UPRIGHT

Anchored "no parking" signs with a heavy spring at the base, to permit them to fly upright again if struck by a car, have been introduced. Besides saving the trouble of frequent replacement, they are less likely to be taken away and can do but little damage to the auto even in the case of a direct collision.

SPREAD SCREW FOR DOORKNOBS WON'T COME LOOSE

Screws falling out or becoming loose in the doorknob are a common cause of trouble, but this difficulty is said to have been overcome in a patented screw, a little longer than the ordinary variety, that will not come loose of itself. The end is slightly split so that when it is driven into position through the spindle, it strikes the opposite side and the points spread out. This burrs the threads so that the screw will remain firmly in position.

Helmet That Dries the Hair without Disturbing a Wave or Other Form of Coiffure

HELMET HELPS TO DRY HAIR WITHOUT MUSSING WAVE

One of the most recent aids for the hair dresser, introduced at a Paris beauty exposition, is a helmet for drying the hair. Used after a permanent wave or other treatment, it is said not to disturb the locks, and to save time and reduce the danger of taking cold. It fits snugly but without discomfort so that it helps keep the hair in order after a treatment.

AUTOS ARE DRIVEN INTO STORE TO SAVE PARKING

Shoppers will be able to drive their cars directly into the store, make their purchases without getting out and then drive away again, through the development of a specially ventilated market. Fumes from the motors are quickly removed by the action of powerful fans, similar to those used in theaters and public buildings. The system helps solve the parking problem and simplifies the delivery question for the merchant, as he can load articles directly into the customer's car. A market of this type already is operated in California.

COAL TO BE TURNED INTO WOOD IF TIMBER SUPPLY FAILS

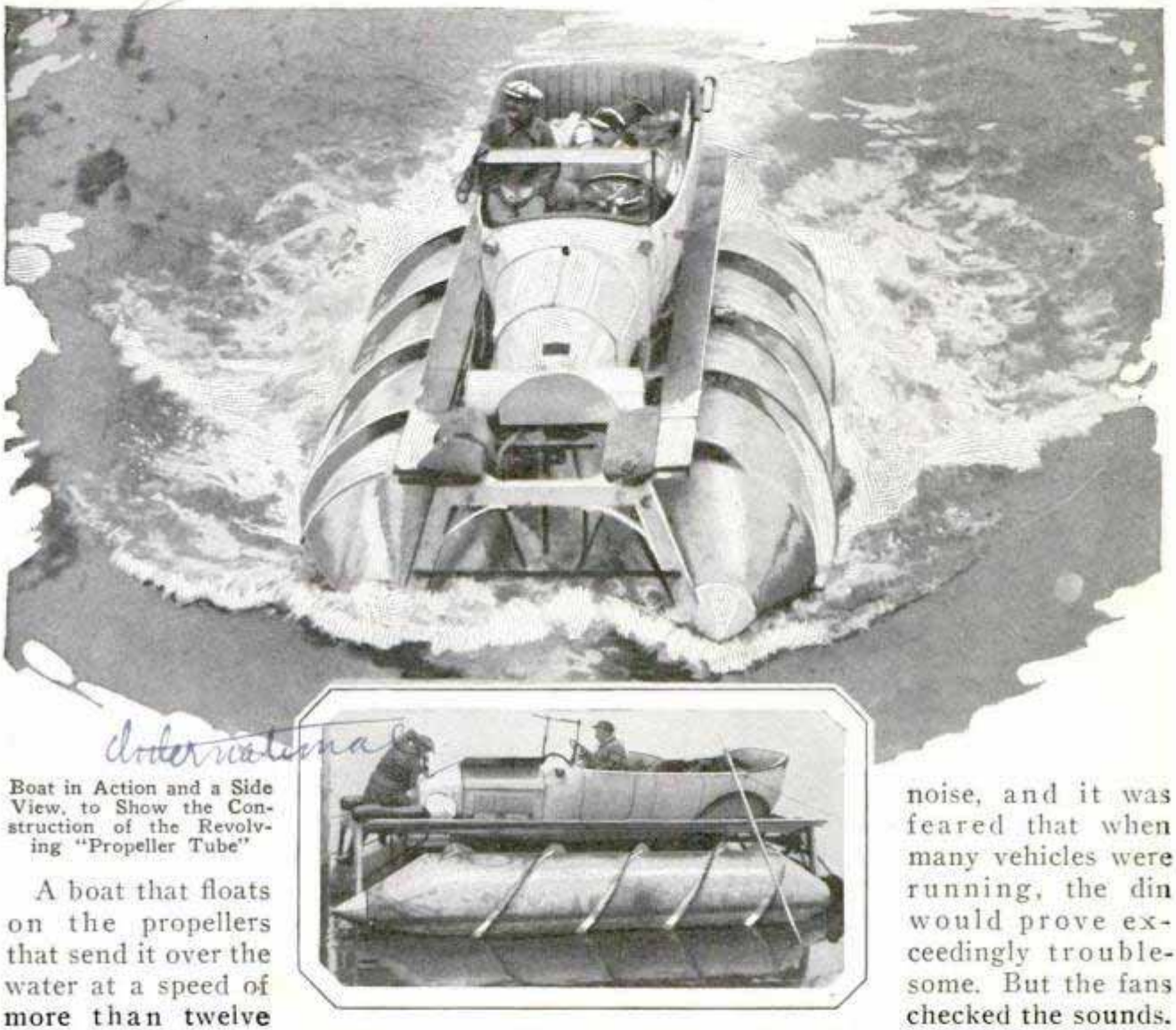
Since coal is largely vegetable matter, scientists will be able to convert it into artificial wood for the manufacture of furniture and many other uses, experts point out. Cellulose or vegetable matter, is now being manufactured into synthetic wood for various purposes. It is durable, hard and heavy, and takes a good polish. A large supply is seen in the tropics where trees and plants now grow in great profusion and are serving no useful purpose.

GIANT BUILDING WOULD HOLD A SMALL CITY

Twenty thousand workers, besides thousands of other persons, visitors and shoppers, will be accommodated in the huge New England building which has been started in Boston. The structure will cost $21,000,000, will occupy 130,000 square feet of ground area and will be twenty-five stories high at the peak, tapering off in the familiar set-back style which has become popular in large American cities. Besides offices, the building will have a big department store to occupy ten acres of floor space, a permanent exhibition hall to display New England industries, and in the sub-basement will be automobile parking space. Elevators will convey the machines to the street level. A steel-supported awning will protect pedestrians from rain on all four sides of the building.

Drawing of the New England Building for Boston; It Will Cost $21,000,000 and Have Space for 20,000 Workers

NOVEL BOAT IS DRIVEN BY TORPEDO-LIKE TUBES



Boat in Action and a Side View, to Show the Construction of the Revolving "Propeller Tube"

A boat that floats on the propellers that send it over the water at a speed of more than twelve miles an hour has appeared in Paris. The floats rotate and propulsion is effected through the screw flanges on the sides of the units. An automobile motor furnishes the power, and the hull of the craft is a car body.

FANS REDUCE ROAR OF TRAFFIC IN VEHICLE TUNNEL

The eighty-four ventilating fans in the Holland vehicular tunnel under the Hudson river not only conquer the menace of poison fumes from the automobiles, but greatly reduce the intensity of sound vibrations, engineers report. The effect is caused by disturbance of the air currents so that the noises are "broken up." On one of the first trips through the passage, when the fans were not running, persons inspecting the tunnel were bothered by the noise, and it was feared that when many vehicles were running, the din would prove exceedingly troublesome. But the fans checked the sounds. It has been found that proper ventilation of auditoriums by circulating the air also has a beneficial effect on the acoustic properties when noises are likely to be echoed in such a way as to prove disturbing. The action of wind currents on sound is easily demonstrated when trying to shout against a stiff breeze or to hear the whistle of a locomotive when the wind is carrying the sound away. Some engineers have thought that further relief from noises in subways and other tunnels might be achieved by insulating the walls with absorbent materials.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

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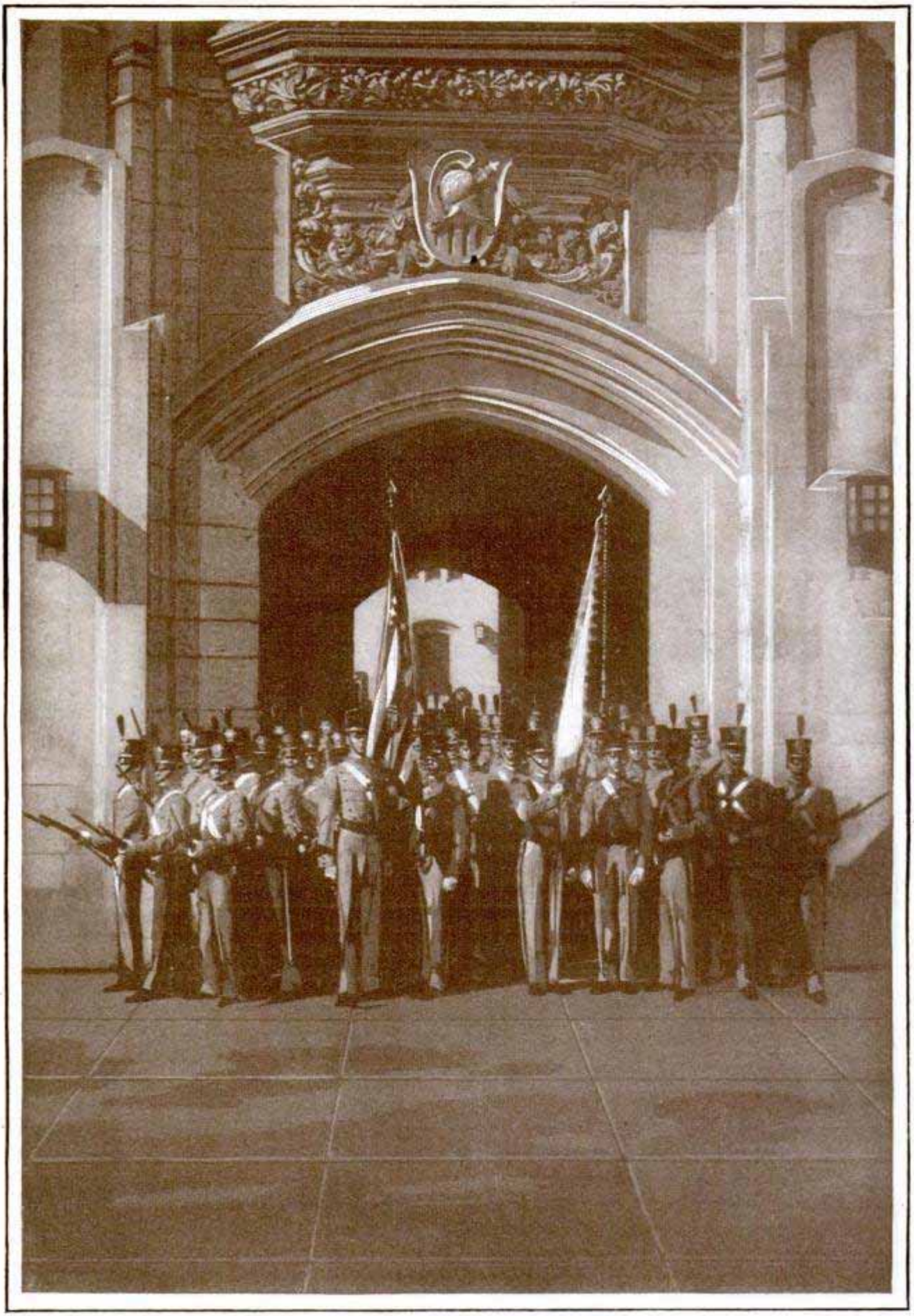
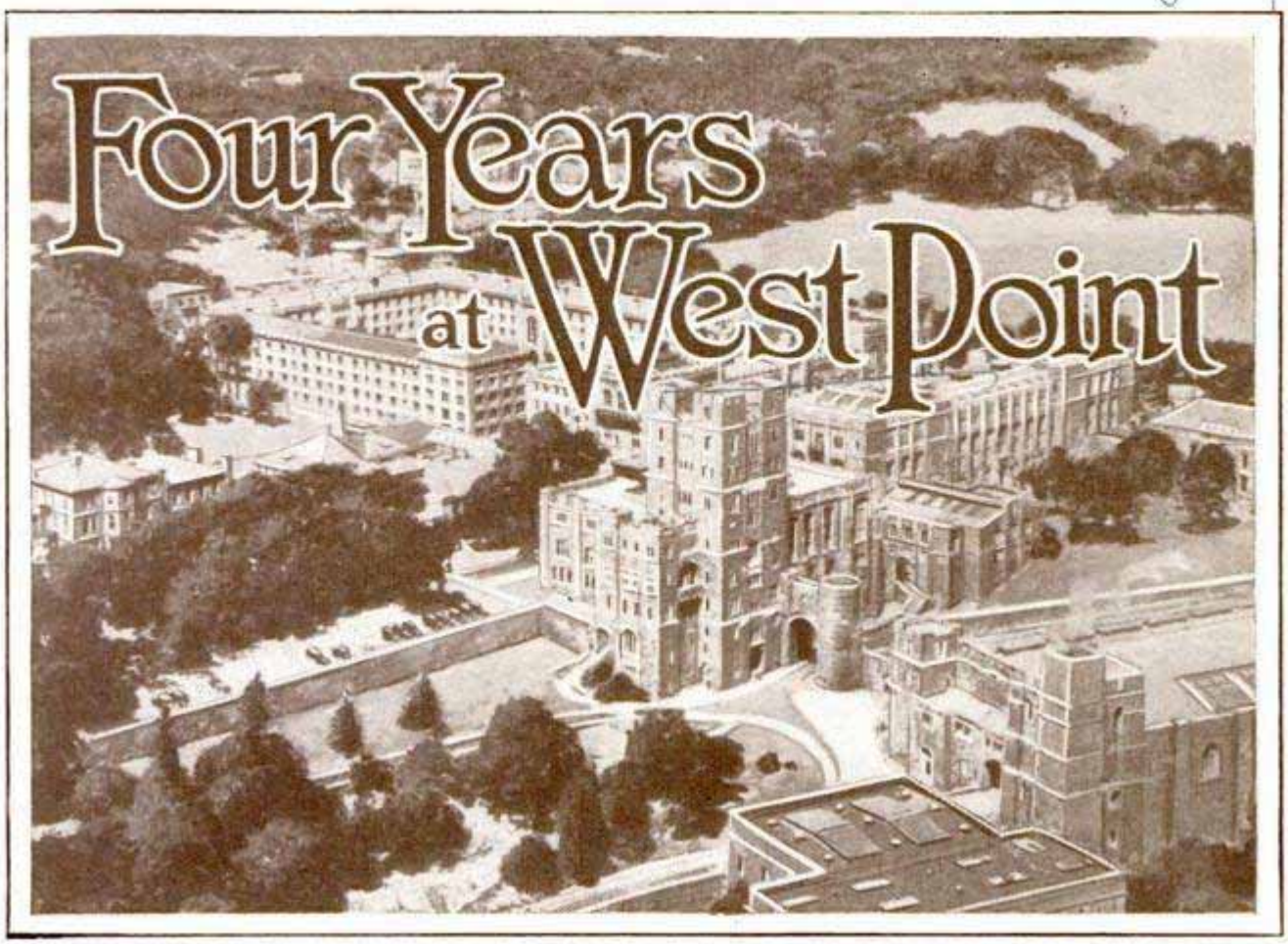


Like the Sally Port of an Ancient Castle, the Entrance to the West Point Barracks, with the Arms Carved in the Stone Above, Frames the Colors and Armed Cadets

Cmdr. A.A. Albelli,
c/o News, 25 Park Place. 3916 Newfork.

Four Years at West Point



West Point Military Academy from the Air, with the Majestic Hudson in the Background; the Training School for Army Officers Crowns the High Bluffs above Bear Mountain

I—The First and Second Years

EVERY year, in "June week," some 300 or more young lieutenants leave West Point, on the Hudson, for the far-flung army posts of the country, and, about July 1, nearly 400 boys, ranging from seventeen to twenty-two years, arrive to learn how to be army officers.

For four years they are put through one of the most complete drills ever devised to turn raw material into men ready at a moment's notice to take over infantry, artillery, cavalry, machine guns, tanks or go up in the air in planes.

When the new "plebe" reports at the academy, his first job is to deposit $250 at the treasurer's office to cover uniform and equipment. After that the government pays all expenses. With that formality over, he gets an immediate lesson in how to stand, salute and report to a superior officer. Then he is assigned a room and the real grind begins.

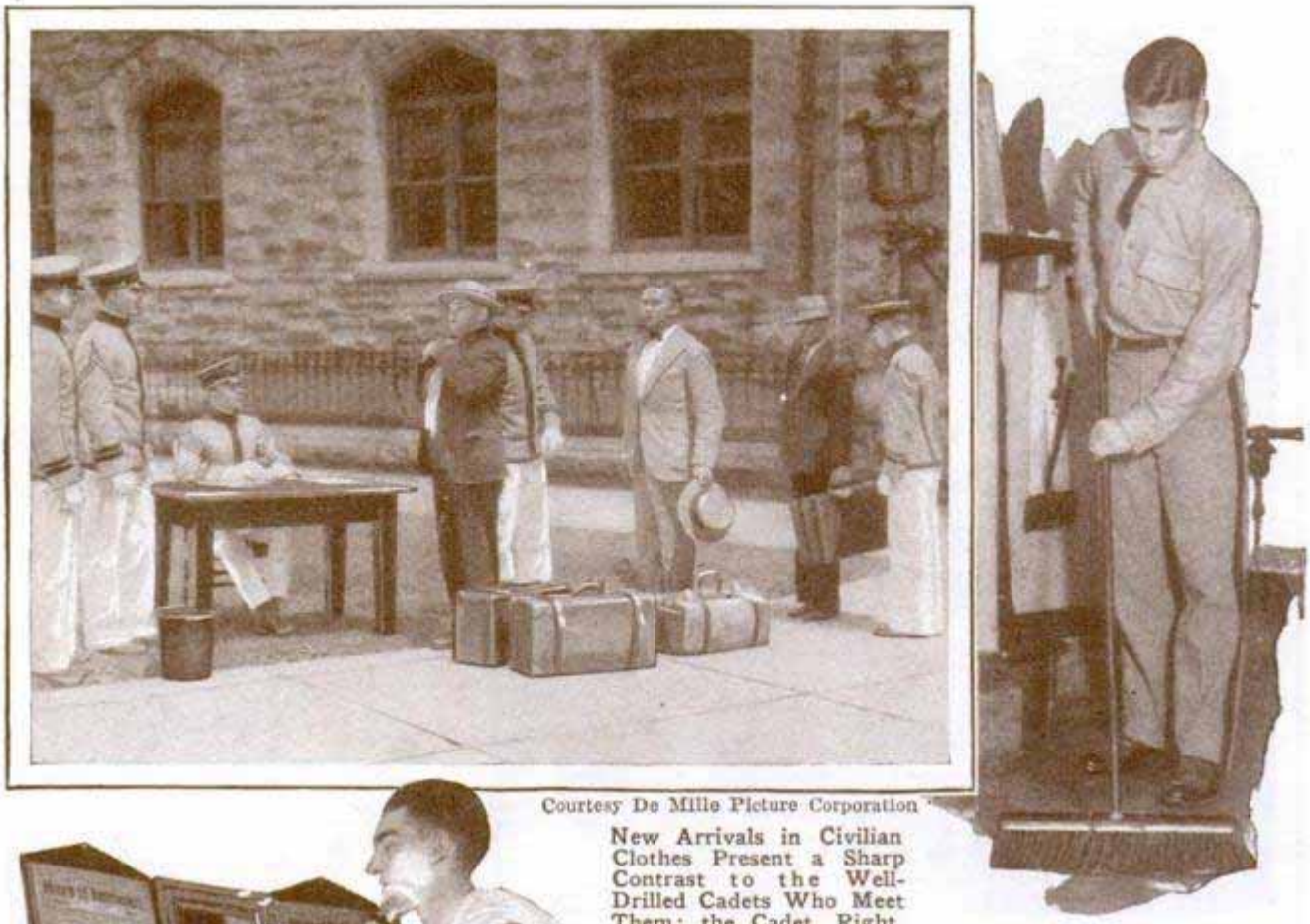
For two hot summer months, under direction of a picked detail of first-class men, called the "beast detail," the new cadets are worked over into a perfectly drilled machine, ready to take their place in the cadet corps in the fall. After the summer drill the plebes are taken out for a week's cross-country hike, and then settle down for the regular routine. Reveille sounds each day at 6 a. m., classes are held from 7:55 a. m. to 3 p. m., tattoo orders the students to bed at 9:30 p. m., and at 10, taps ends the day.

There is no vacation at the end of the first year but summer camp on the post, and then the grind resumes, in mathematics, tactics, surveying, English, French and gymnasium work. Tactics covers infantry, artillery, cavalry drill and special branches.

With the second year the ex-plebe, who theretofore had been rigorously excluded from companionship with his elders, enters into the joys of being a yearling. Every Saturday night there is a hop lasting until midnight, and at Christmas he gets his first vacation, while with June week he will get two months' furlough at home. Next month's issue will tell the story of the final two years in the cadet corps.

Information relative to appointment and 563
admission of cadets U.S. Military Academy

W12. 9:926
West Point, Ny. 50 p. illus. 10¢



Courtesy De Mille Picture Corporation

New Arrivals in Civilian Clothes Present a Sharp Contrast to the Well-Drilled Cadets Who Meet Them; the Cadet, Right, Above, Takes Care of His Own Quarters

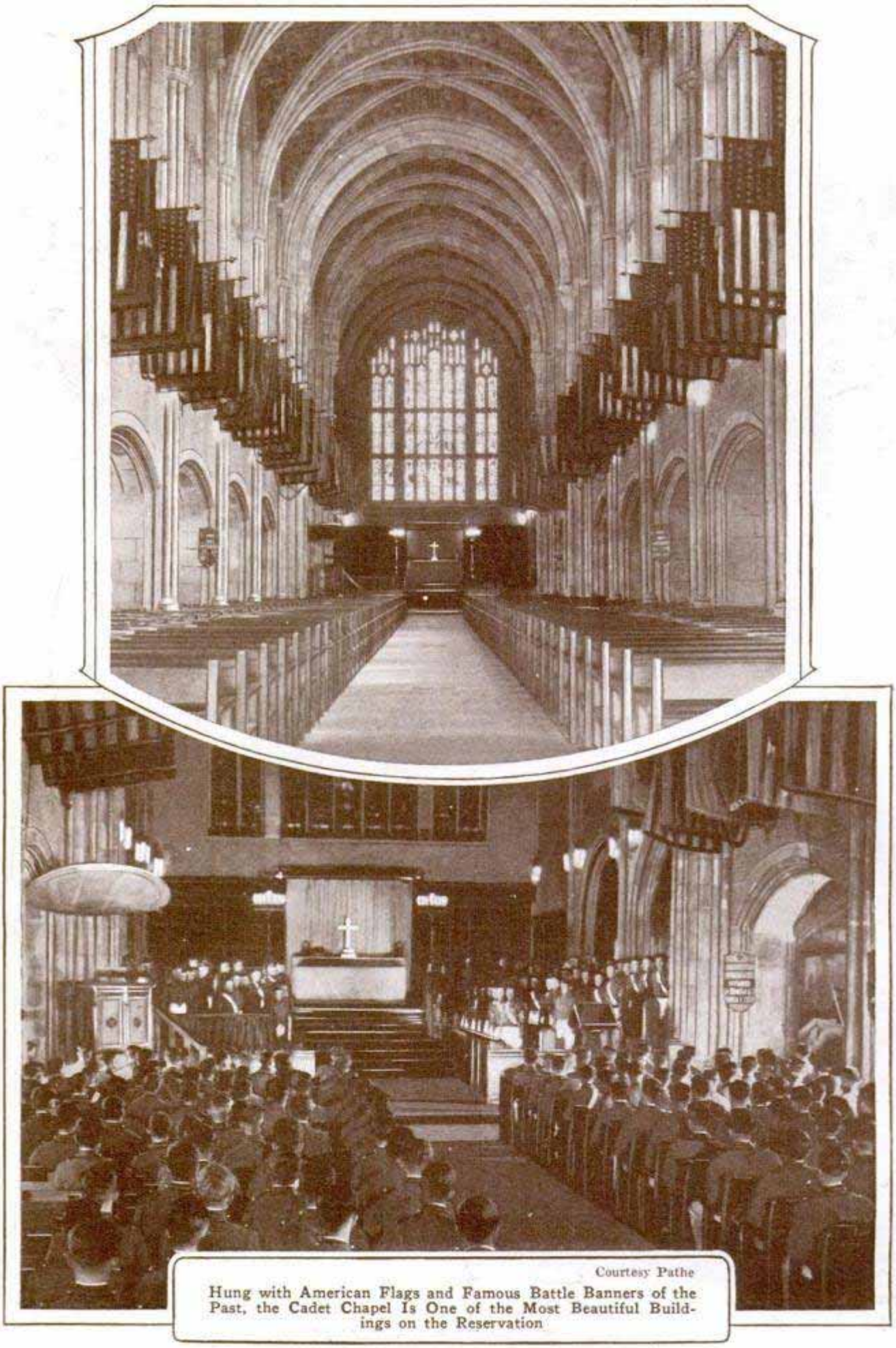
The Academy Barber Shop Cuts Hair, But the Student Must Do His Own Shaving, Gazing into a Mirror Flanked by Charts That Tell Him What He Must Do with Every Minute of the Day; Right, Field Conditions Are Reproduced in the Dormitory, Where the Embryo Officers Wash Up in the Chilly Dawn in Portable Basins, and Carry Their Water in Capacious Buckets

Courtesy De Mille Picture Corporation

The First Step in Learning How to Drill Others Is to Be Drilled Yourself, and the West Point Cadets Spend Untold Hours Going through Infantry, Cavalry, Artillery and Other Drills Until They Are Letter-Perfect in Each

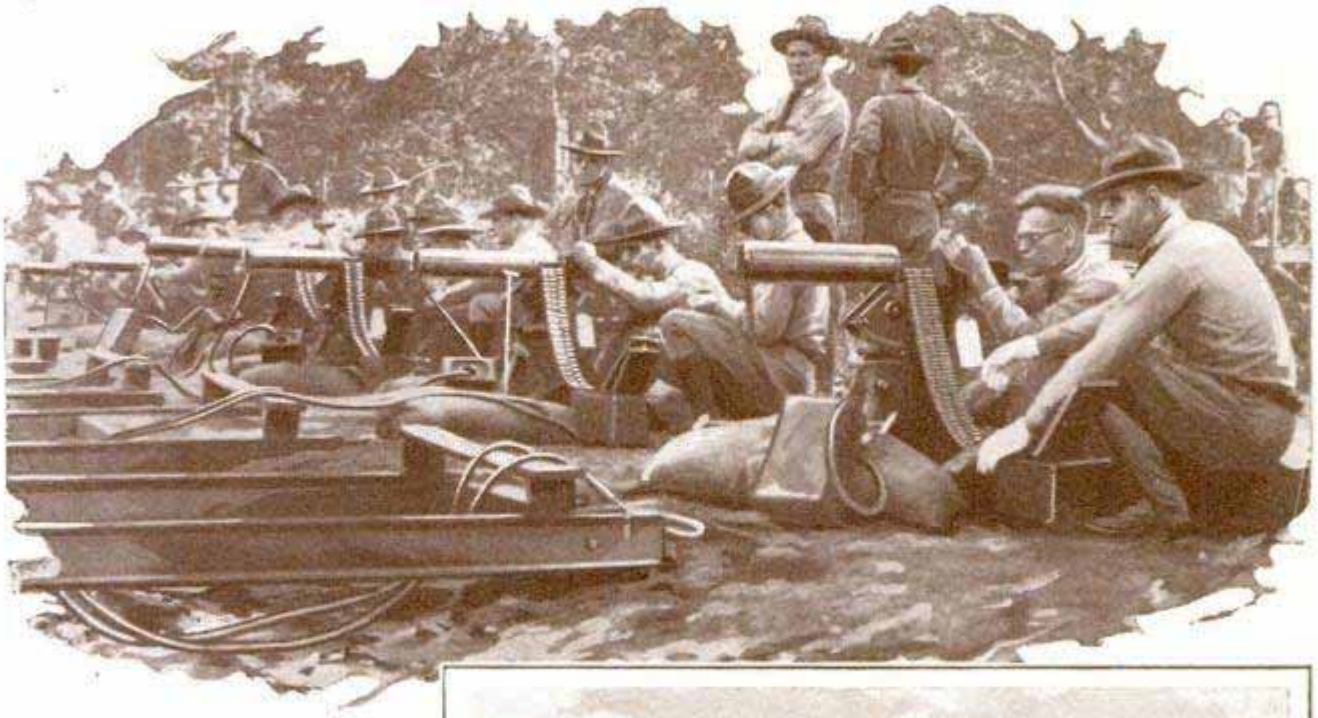
Third-Class Men Cleaning a Seventy-Five-Millimeter Gun after Target Drill

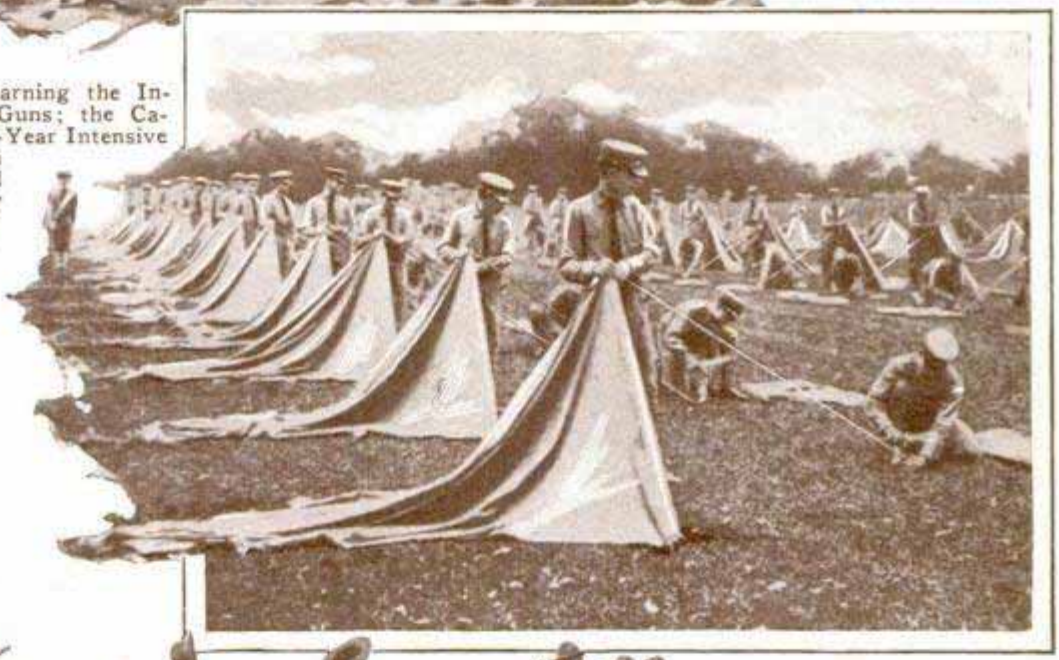
Three Times Each Day the Entire Corps, Grouped According to Classes, Assembles in the Big Dining Hall for Meals



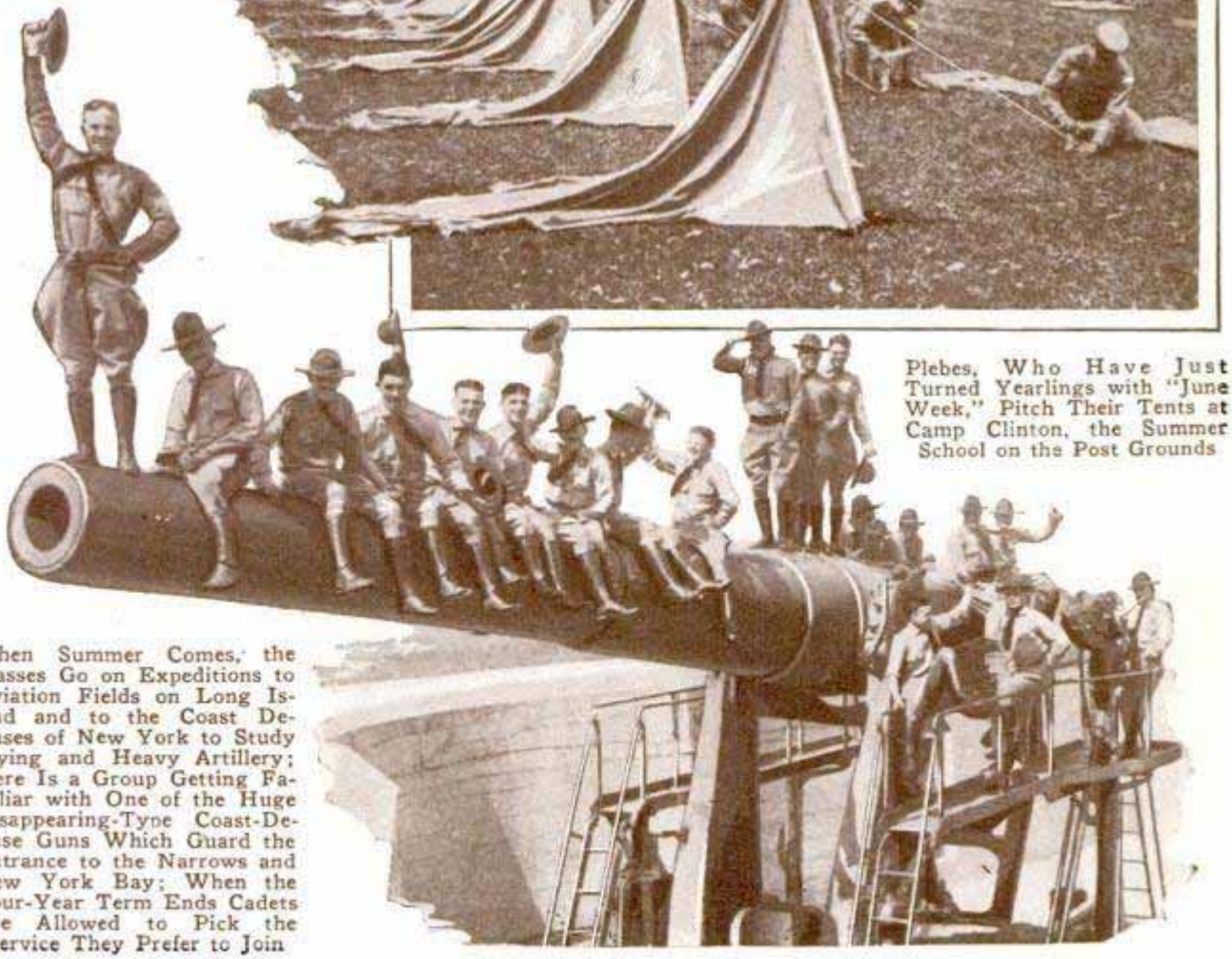
Courtesy Pathe

Hung with American Flags and Famous Battle Banners of the Past, the Cadet Chapel Is One of the Most Beautiful Buildings on the Reservation





Second-Class Men Learning the Intricacies of Machine Guns; the Cadets Are Given a Four-Year Intensive Course in Every Form of Maneuver and Trained to Use Every Type of Arms



Plebes, Who Have Just Turned Yearlings with "June Week," Pitch Their Tents at Camp Clinton, the Summer School on the Post Grounds

When Summer Comes, the Classes Go on Expeditions to Aviation Fields on Long Island and to the Coast Defenses of New York to Study Flying and Heavy Artillery; Here Is a Group Getting Familiar with One of the Huge Disappearing-Type Coast-Defense Guns Which Guard the Entrance to the Narrows and New York Bay; When the Four-Year Term Ends Cadets Are Allowed to Pick the Service They Prefer to Join

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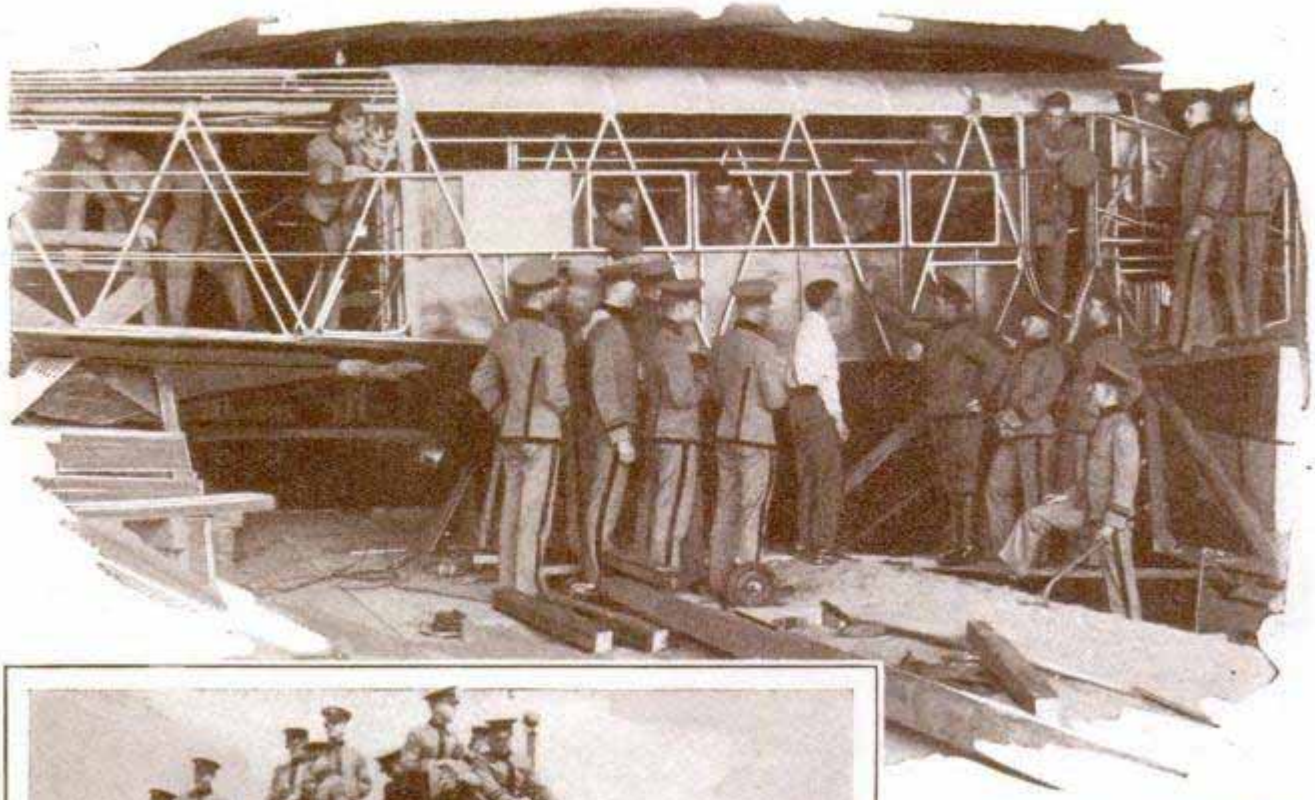
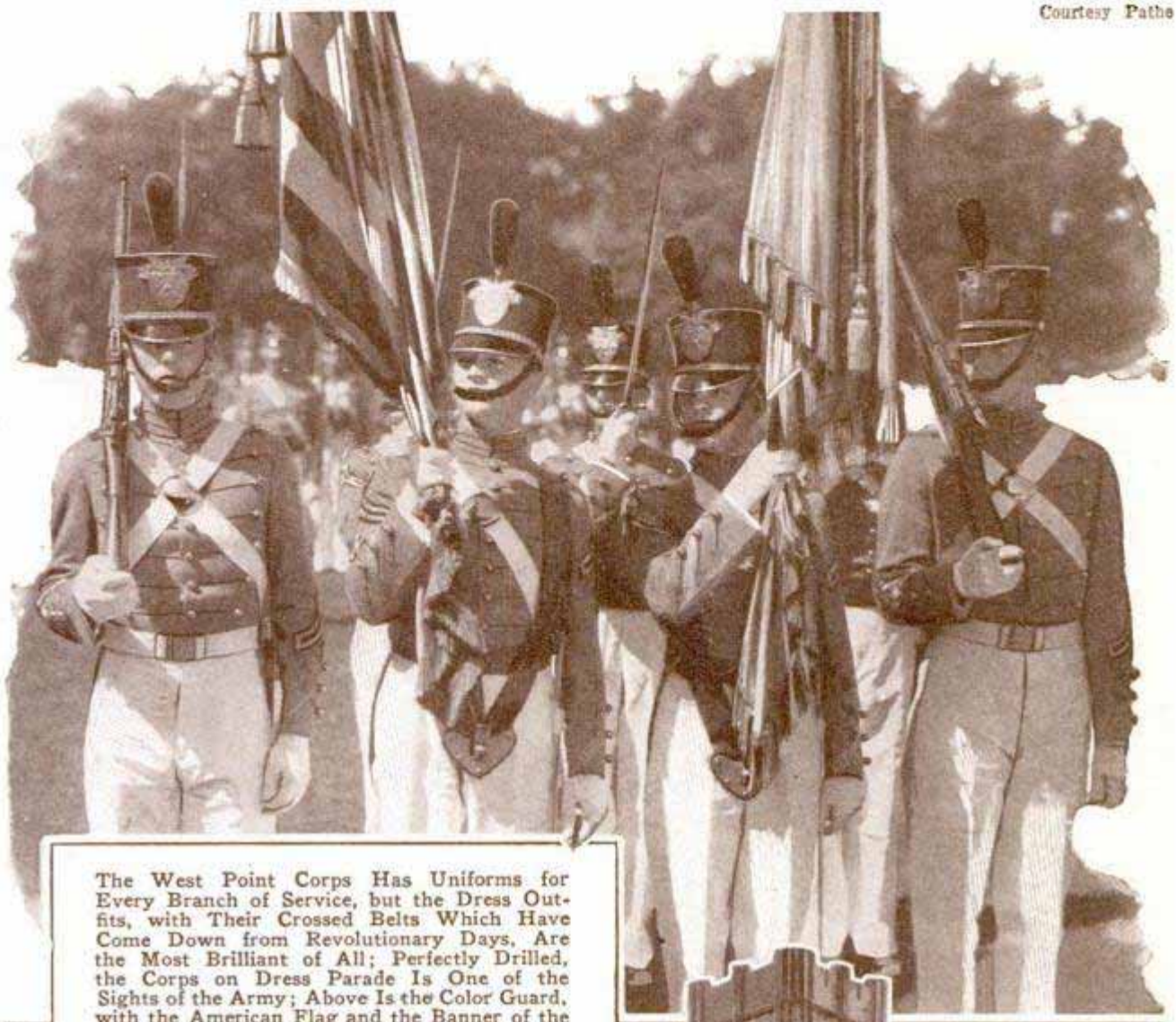


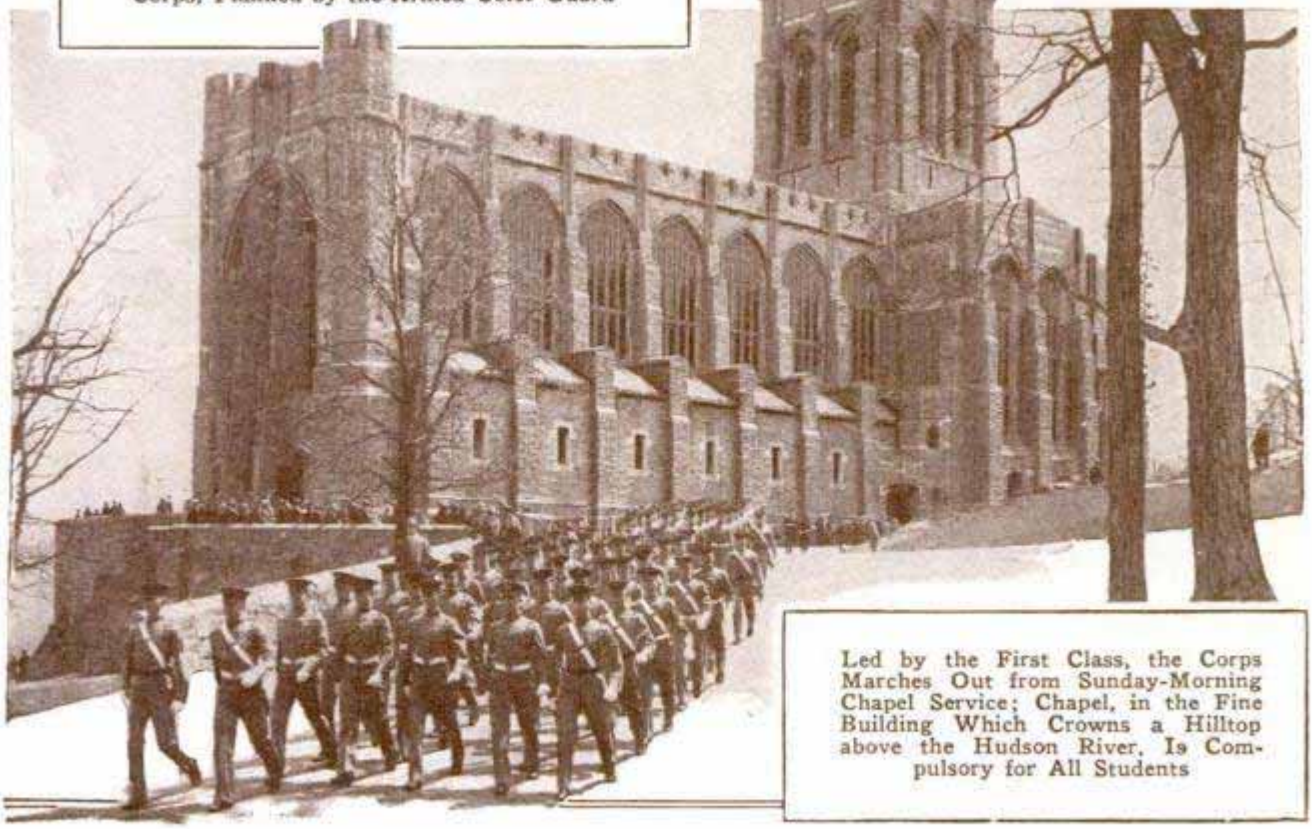
Every Time a New Weapon Is Created Training at West Point Becomes More Complex; Above, a Group of Future Generals Are Learning What an Airplane Looks Like Before the Cover Is Put On, While at the Left They Are Making the Acquaintance of a Large-Size Battle Tank during a Visit to Aberdeen Proving Ground, Where the Entire Corps Is Given a Lesson in Ordnance Testing and Permitted to See the Latest Weapons; Below, Horsemanship, Too, Is Required, and Cavalry Drill Is Regular

Courtesy Metro-Goldwyn-Mayer

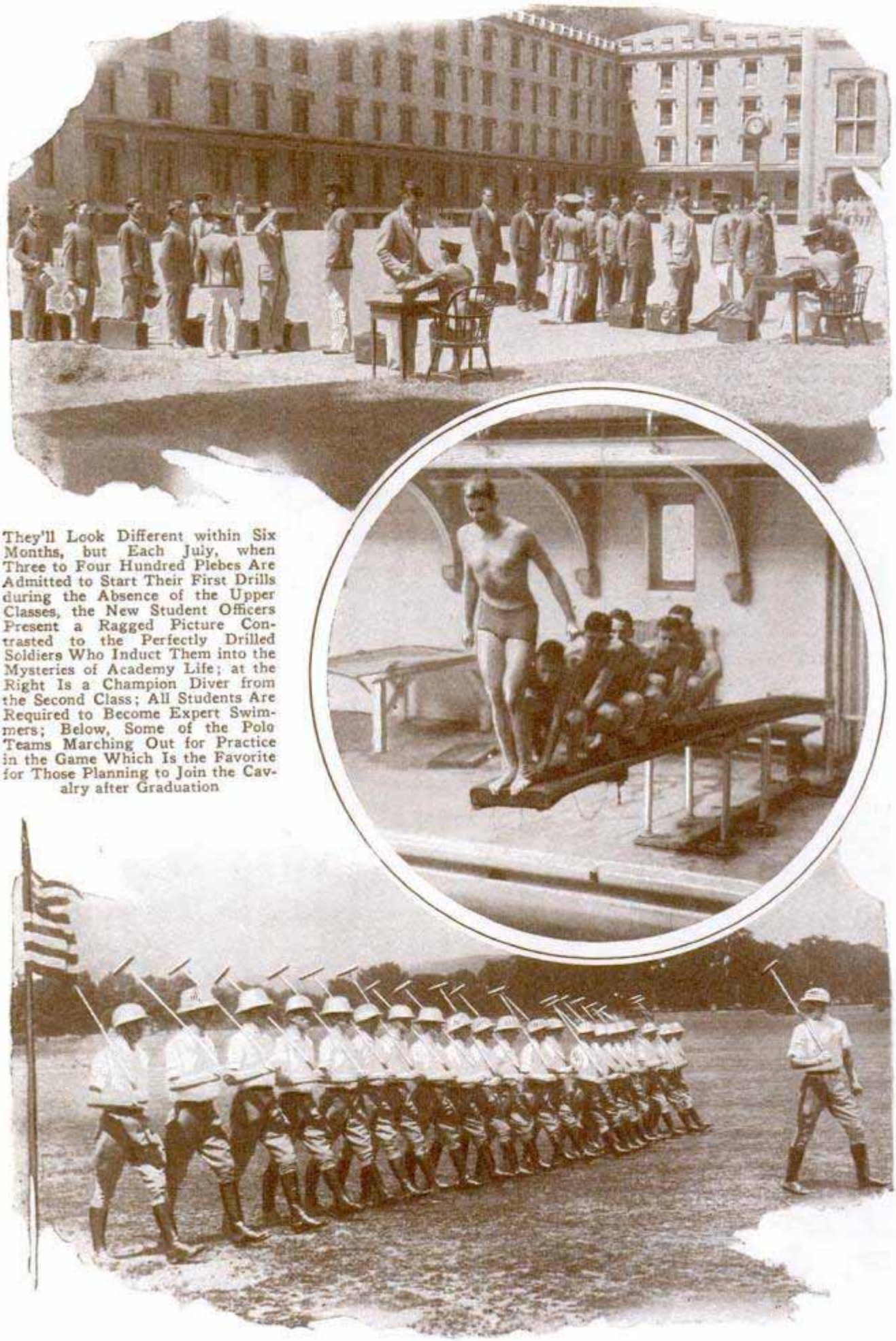
Courtesy Pathe



The West Point Corps Has Uniforms for Every Branch of Service, but the Dress Outfits, with Their Crossed Belts Which Have Come Down from Revolutionary Days, Are the Most Brilliant of All; Perfectly Drilled, the Corps on Dress Parade Is One of the Sights of the Army; Above Is the Color Guard, with the American Flag and the Banner of the Corps, Flanked by the Armed Color Guard



Led by the First Class, the Corps Marches Out from Sunday-Morning Chapel Service; Chapel, in the Fine Building Which Crowns a Hilltop above the Hudson River, Is Compulsory for All Students



They'll Look Different within Six Months, but Each July, when Three to Four Hundred Plebes Are Admitted to Start Their First Drills during the Absence of the Upper Classes, the New Student Officers Present a Ragged Picture Contrasted to the Perfectly Drilled Soldiers Who Induct Them into the Mysteries of Academy Life; at the Right Is a Champion Diver from the Second Class; All Students Are Required to Become Expert Swimmers; Below, Some of the Polo Teams Marching Out for Practice in the Game Which Is the Favorite for Those Planning to Join the Cavalry after Graduation

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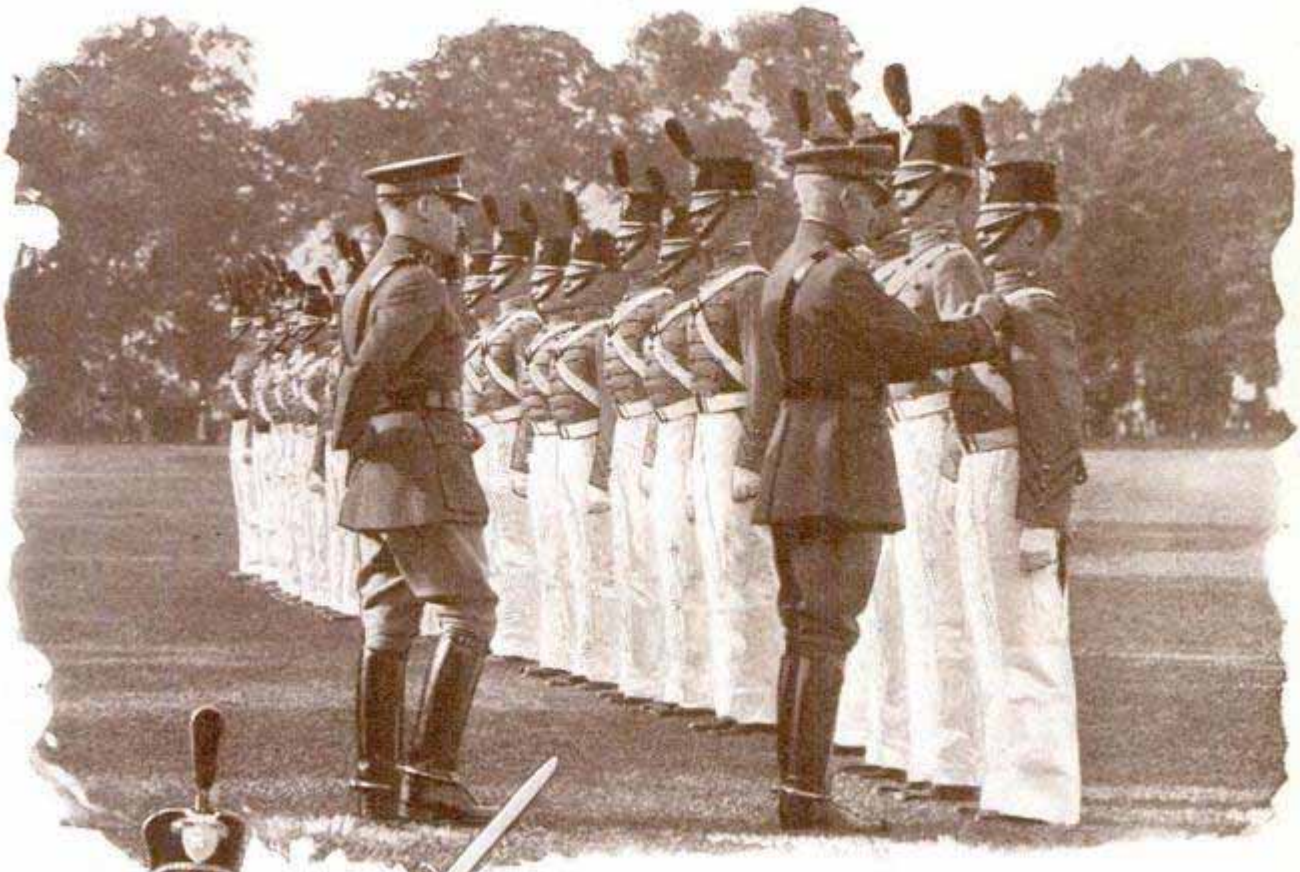
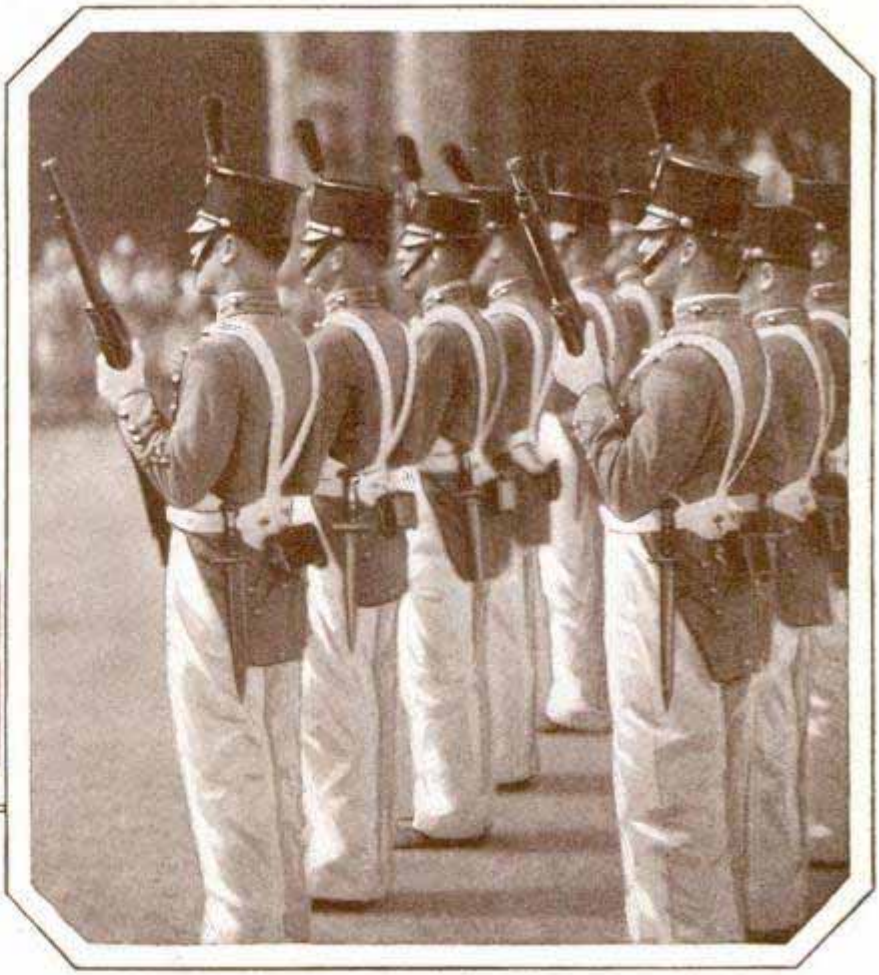
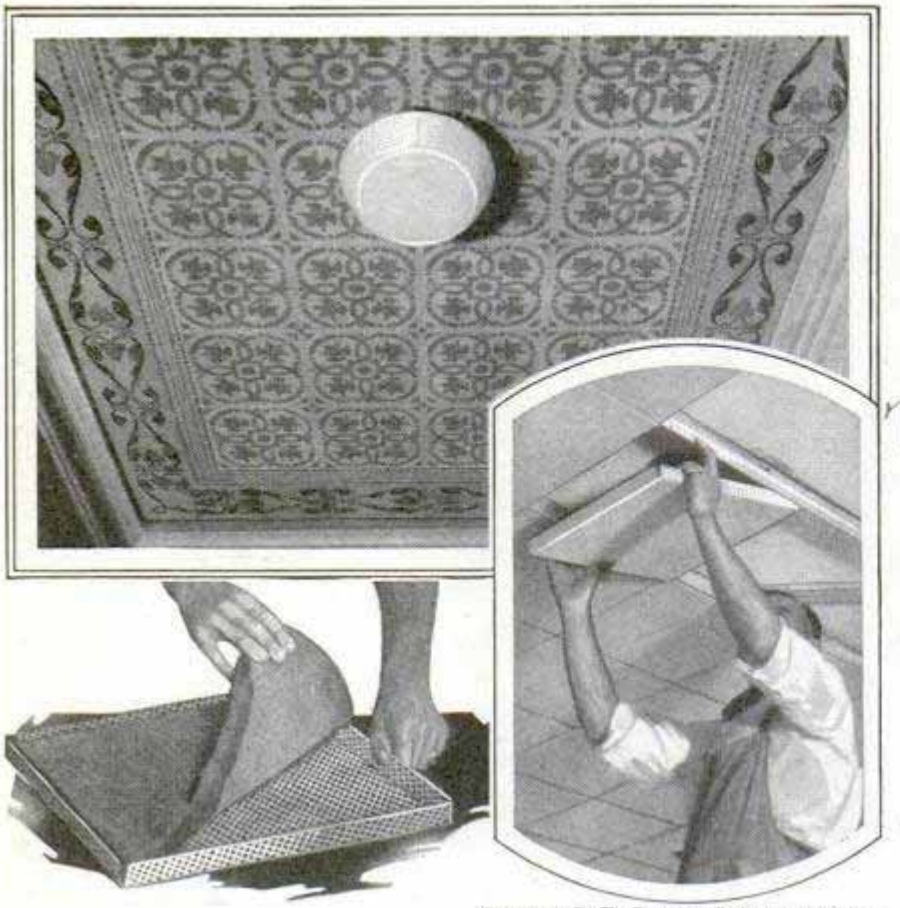


Major General Sladen Bestowing Stars on a Cadet Who Won Highest Honors on His Class Merit Roll, One of the Ceremonies of June Week; Like the Naval Academy at Annapolis, West Point Demands Almost Perfect Scholarship



Courtesy De Mille Picture Corporation

Two Scenes from a Movie of West Point Life; the Corps Presenting Arms, and a Film Star Demonstrating His Ability in the Same Line



Courtesy C. F. Burgess Laboratories, Inc.

Finished Ceiling of the Tile; Installing Units, and Section to Show Structure of the Material

FIRE AND SOUND-PROOF TILE HAVE NOVEL FEATURES

A new type of sound-proofing material for offices and other building interiors has been developed by a Wisconsin company to remove the objections which many forms of sound-deadening materials have had. The new material, called "sanacoustic tile," combines acoustic properties with sanitary and fireproof requirements. The exposed surface is a metal tile, pierced by a multitude of small holes and backed by one inch of non-combustible sound-absorbing material. The metal face may be painted or decorated in any manner, can be washed with water without spoiling its acoustic properties, and can be repainted time and again without lessening its ability to absorb sound waves. Light metal clamp strips are attached to the ceiling, sixteen inches apart, and the tiles, which are sixteen inches square, will lock automatically when they are slid into place.

MAN-MADE GALES NEEDED TO PLAY BIG ORGANS

Millions of pounds of air are blown within the pipe organs of the United States every day to provide music in the nation's churches, theaters and other buildings. Veritable gales of wind are created by powerful blower-type fans to produce the notes. In the modern pipe organ, the fans are constructed with a special motor, mounted as a unit on an absorbent foundation and provided with a flexible air-pipe connection so that not the slightest noise from machinery or other causes will be magnified or travel through the air, disturbing the quietness of a church or similar building.

EARMUFFS ON FELT HELMET PARTLY HIDDEN BY HAT

Attached to a felt-and-elastic helmet of bands that can be quickly slipped on and is almost completely hidden by the hat or cap, earmuffs now on the market have no troublesome steel support to worry about, can be carried in the pocket and fit snugly without slipping. They are made in two sizes, small and large, and are adjustable to fit the wearer, as an elastic forehead band gives considerable flexibility and adds to the comfort.

Earmuff Helmet in Place, and as It Appears When the Hat Is Worn; It Cannot Slip Off

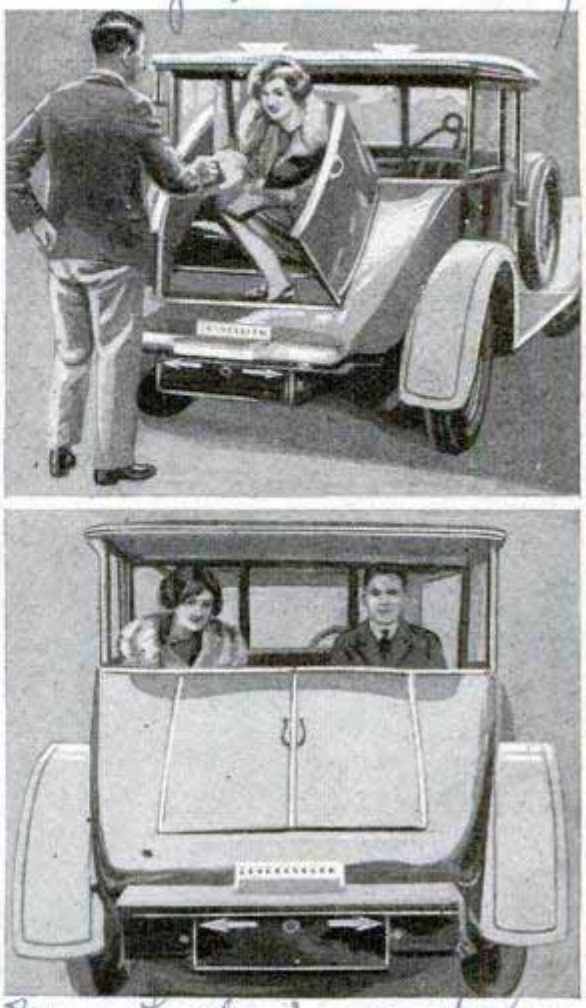
PHOTO CELL MORE SENSITIVE TO AID TALKING MOVIES

Improvement in talking motion pictures is anticipated as the result of the development of a photo-electric cell that is said to be twelve times as sensitive as any yet prepared. These cells are the magic little units employed to transmute light vibrations into those of sound so that the film will "talk" as it passes over the screen. The new cells are also said to be much more durable than the older ones, which had a maximum service lifetime of not more than 3,000 hours. The improvement in the cell is obtained by coating the inside of the glass tube with a substance that is so highly sensitive to light that it permits the cell to react at the slightest change in the intensity of illumination.

GOLF SET FOR SMALL LAWN SAVES DIGGING HOLES

Nine holes of golf can be played on a plot of ground as small as forty-five by twenty-five feet and a putting course about 250 feet in total length afforded, with a set recently introduced. Instead of digging holes, special traps are used. These are conical disks suspended on slender metal pins which may be inserted in the turf without damage to it and quickly taken out for a change of position. Each disk is so arranged that a ball trapped under it would fall into a hole, were one there, and thus helpful practice may be gained. Balls that go through the trap would also run over the hole. The outfit is easily set up, gives beneficial training in putting and is specially adapted to lawns and yards too small for tennis or similar games.

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.



Rear Views of the Observation Auto, Showing the Folding Door and Large Window in Back

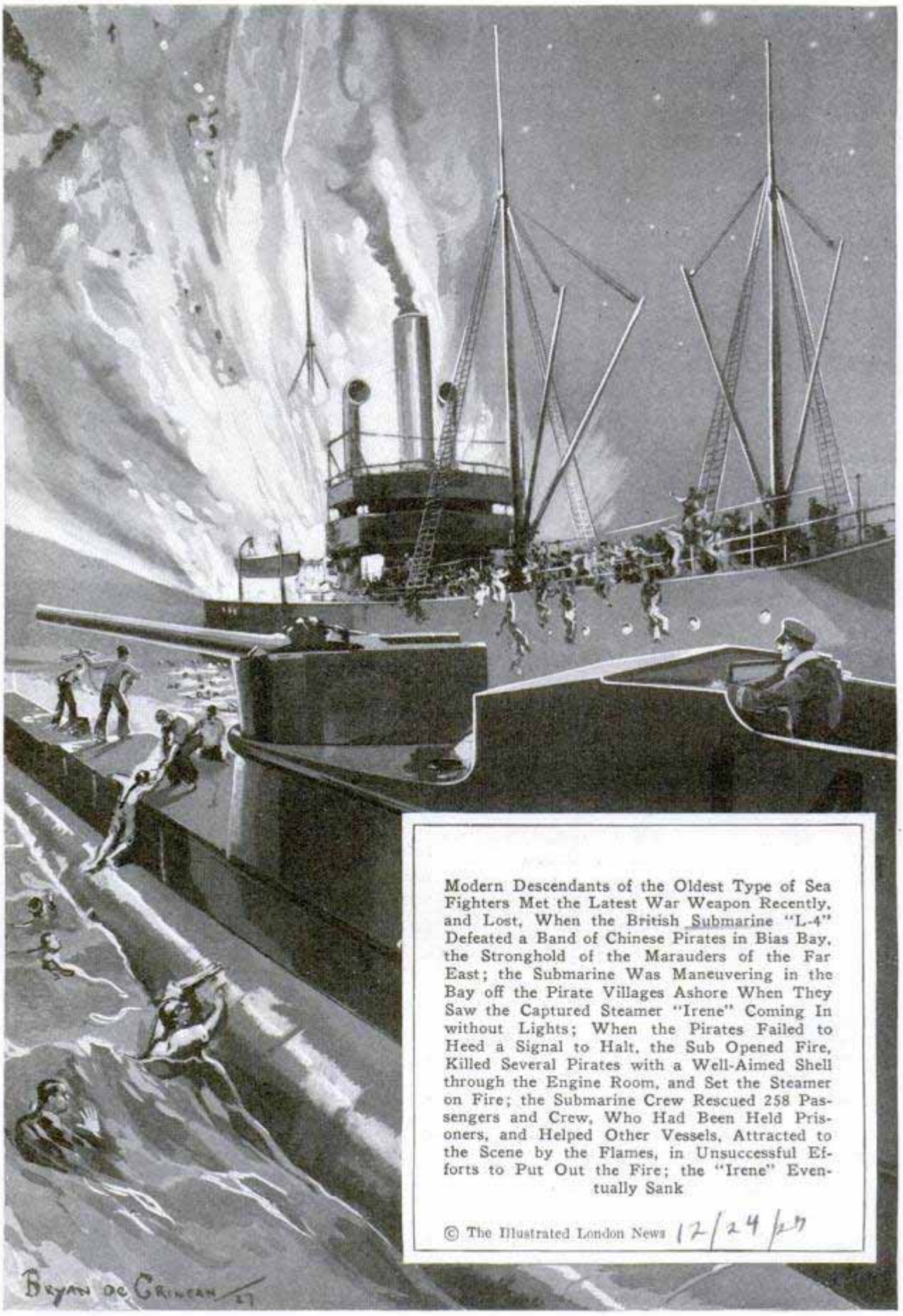
AUTO LIKE OBSERVATION CAR HAS REAR ENTRANCE

Passengers enter and leave from the rear of an observation automobile recently introduced in England and sit with their backs to the driver. The car is modeled somewhat after a railroad observation coach, to afford an unobstructed view.

PADS SAVE WORKERS' KNEES AND PRESERVE CLOTHING

To spare the knees from bruises and soreness and to protect the clothing, pads have been devised for wear when tasks require kneeling. They are made in different styles, a waterproof variety being furnished for such work as laying concrete.

SUBMARINE WINS ITS FIRST BATTLE WITH PIRATES



Modern Descendants of the Oldest Type of Sea Fighters Met the Latest War Weapon Recently, and Lost, When the British Submarine "L-4" Defeated a Band of Chinese Pirates in Bias Bay, the Stronghold of the Marauders of the Far East; the Submarine Was Maneuvering in the Bay off the Pirate Villages Ashore When They Saw the Captured Steamer "Irene" Coming In without Lights; When the Pirates Failed to Heed a Signal to Halt, the Sub Opened Fire, Killed Several Pirates with a Well-Aimed Shell through the Engine Room, and Set the Steamer on Fire; the Submarine Crew Rescued 258 Passengers and Crew, Who Had Been Held Prisoners, and Helped Other Vessels, Attracted to the Scene by the Flames, in Unsuccessful Efforts to Put Out the Fire; the "Irene" Eventually Sank

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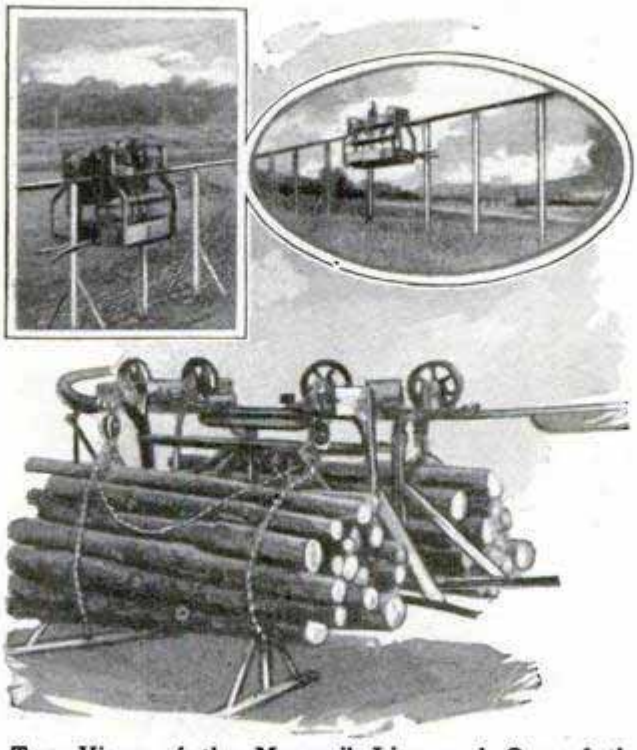
MANY NEW INVENTIONS FOUND OF ANCIENT ORIGIN

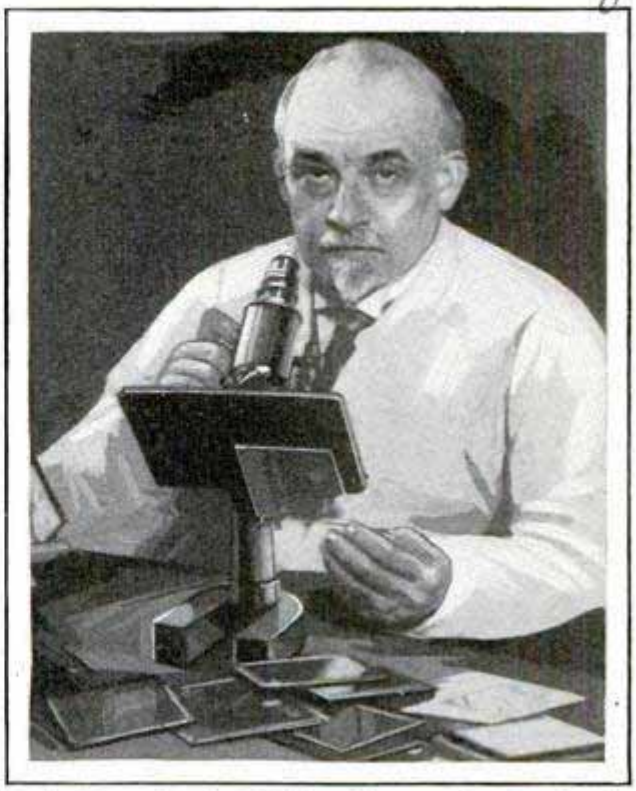
More than 2,500 years ago, the Greeks knew how to spin tops, they had pocket-knives with bronze blades and exquisitely carved ivory handles, and clasp pins, much like the safety pin by which its modern inventor made a fortune, were common. A process for making clear yellow-white glass was announced as a new discovery not long ago, but excavations in Egypt show that the material was known there in the second century B. C. A set of 150 pieces was recovered from the ruins of an ancient city. A sewer system that would compare favorably with any constructed today was laid in Crete some 2,500 years B. C., and you can turn the faucets of a system that was installed in ancient Pompeii. Checkers, dice games, parchesi and many other "modern" sports were known to the ancients, athletes of old threw the discus, had developed styles in running that compare favorably with those of the swiftest sprinters of today and prize fighters wore knuckles instead of gloves.

MONORAIL LINE RUN OVERHEAD TO ESCAPE SNOWDRIFTS

Heavy snows and storms have little effect on a monorail system especially for industrial purposes, as the cars run on an elevated track. The line has been employed to good advantage at mines and timber tracts, but may also be used for carrying passengers. Each car holds about ten tons and the engine is placed on top of the forward car. Cheaper construction is another feature in favor of the system, the cost ranging from $1,500 to $3,000 per mile, depending upon the character of the country traversed.



Two Views of the Monorail Line, and One of the Carriers Showing How a Load Is Balanced



Prof. Oscar Focht Making Microscopic Examination of Lenin's Brain

MYSTERIES OF BRAIN STUDIED AT SPECIAL INSTITUTE

An "institute of brains" has been opened in Moscow for special research into the mysteries of the human nervous system and the brain. One of the aids in use there is a remarkable instrument that divides the brain into five equal sections, and makes a wax impression of it at the same time. After this, the organ is cut into 25,000 to 30,000 thin slices for study under the microscope. The brain of Lenin, the late Russian leader, has been studied in this way and directors of the institute propose to examine the brains of other great persons in Russia after their death. It has been announced that the examination of Lenin's brain indicated that he had great mental powers.

TASSEL FRINGE ON VANITY BOX CONCEALS LIPSTICK

Convenient Vanity Box That Has Space for Coins and Cigarets While Tassel Hides Lipstick

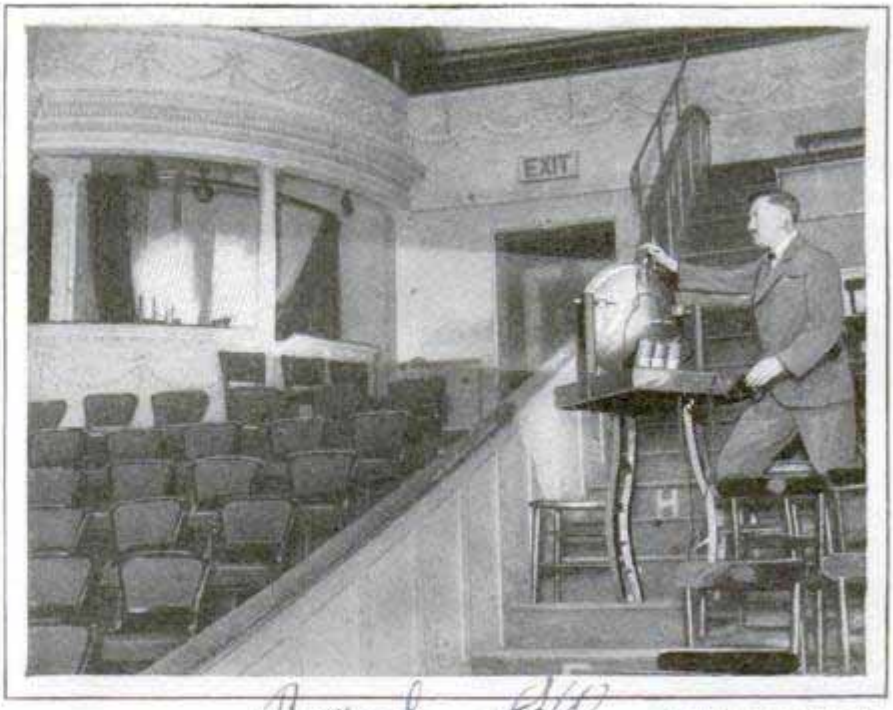
Space for a cigaret and coins is provided in a tube-shaped vanity case. The fringed tassel hides a lipstick and the mirror is at the other end. The article is furnished in different colors.

TURNING GOLD INTO COPPER

Alchemists of old sought a way to make gold from baser materials, but modern scientists are said to be considering the possibility of reversing the process and turning gold into copper and tin, should a serious shortage of the latter metals develop. The task is within the range of scientific possibility, it is said, a rearrangement of the electrons being the essential step in the proceeding. At present, the supplies of gold appear to be abundant, but the sources of tin and copper are being depleted in some parts of the world. If they should become so scarce, and the price consequently high enough to justify some such step as a transmutation process, the application to gold would be considered practical, it is reported, because of its durability and adaptability to many of the purposes for which tin and copper are now used.

CHATTERING OF LIGHT HELPS LOCATE BUILDING ECHO

A beam of light and a beam of sound, projected over the same path, recently located the source of echoes which had disturbed audiences in Albert Hall, London. Every time the visible light beam fell on one of the echo-producing spots, it gave back a chattering noise, and the spot was marked down for treatment. The novel echo finder consisted of a light and an electric spark gap, both mounted in the same bowl-shaped reflector, so that both light and sound were projected on the same path. As the beam of light was played over the dome, ceiling and walls, the only sound came from the spark gap, so long as the walls absorbed the waves properly. But when the light reached one of the echo producers, the sound waves were thrown back. Changing fashions are blamed for the development of some of the echoes heard when large audiences are in the hall. The men's suits, still made of wool, continue to absorb sounds, while the harder-finished silks now used by women, are echo producers.



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Hunting the Echoes of Albert Hall, London, with a Beam of Light and an Electric Spark

LOCOMOTIVE IS TURNED INTO AUTO TO HAUL LOGS

Steam Locomotive Mounted on Endless Treads, with a Pilot Sled Steered by a Gear Operated from the Front of the Boiler, as Used in the Minnesota Woods

The combination of the little geared locomotives used in the lumber camps—named "Shays" after their inventor—and the treads used on tractors and battle tanks, has produced a new kind of steam engine for the snow-covered north woods. The Shays have vertical cylinders driving horizontal shafts which in turn are geared to the wheels, giving greater tractive force, and to accent this they are commonly mounted on a single four-wheel truck, concentrating all of the weight on the driving wheels. By replacing the latter with treads, the lumber companies have converted the Shays into steam tractors capable of bucking the heaviest snowdrifts.

WINDMILL LIGHT FOR AUTOS FLASHES COLOR EFFECTS

Easily attached to the front or rear of the automobile, a light bulb has a spinning globe with colored lenses that revolve rapidly as the car moves, due to the wind pressure against four little "windmill wings" on the exterior. This produces novel color effects and adapts the light to designating special cars, such as ambulances, taxicabs or police vehicles, permits the showing of college or lodge colors, and other displays on patriotic or like occasions. The cover reduces glare, and is rust-proof and self-lubricating.

"SILK" SPUN ON SPIDER FARM

Spiderweb is used extensively for cross lines in microscopes, range finders and other exacting instruments. A single strand is too thick in some cases, and has to be split into four sections. This is done under strong magnifying glasses and usually by women, as their hands are steadier than men's. In England, is a special spider farm conducted by a woman. The insects are raised for their web, which is wound like thread on a card.

¶There are said to be more automobiles than telephones in Maryland.

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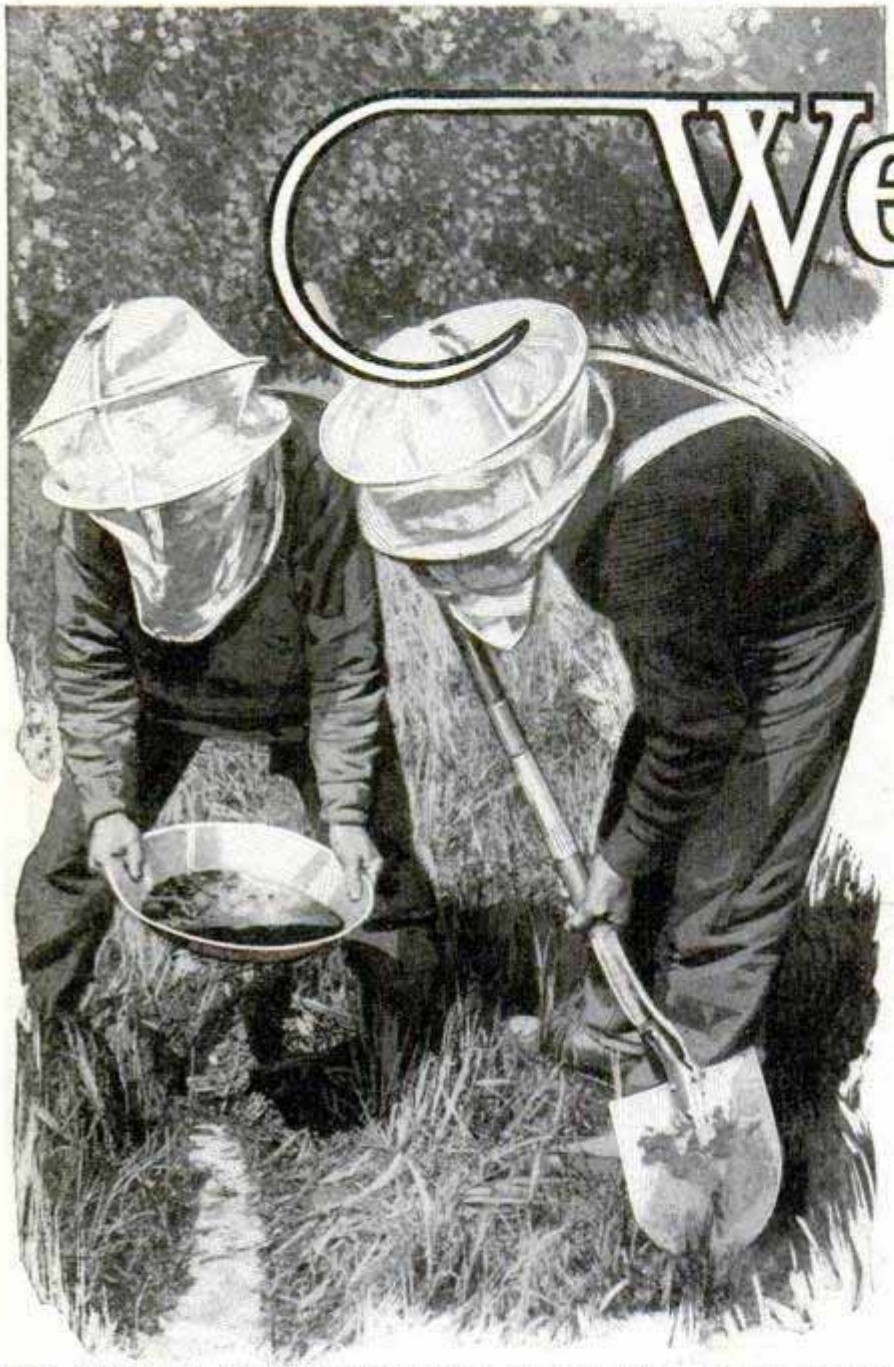
Wealth



Gold Prospectors, Sheltered behind Their Mosquito Nets, Panning for the Precious Yellow Metal in Alaska

By ORVILLE H. KNEEN, St. New York 95 Thayer

THERE are many counterparts of the storied individual who set forth to find a gold mine. You remember he wandered all over the world. At last, broken and discouraged, he dragged himself home. And there in his own backyard he found the gold for which he had scoured the globe. Wealth of one kind or another has often been found under our feet or close at hand. But would you know a valuable mineral deposit if you were lucky enough to stumble across it?

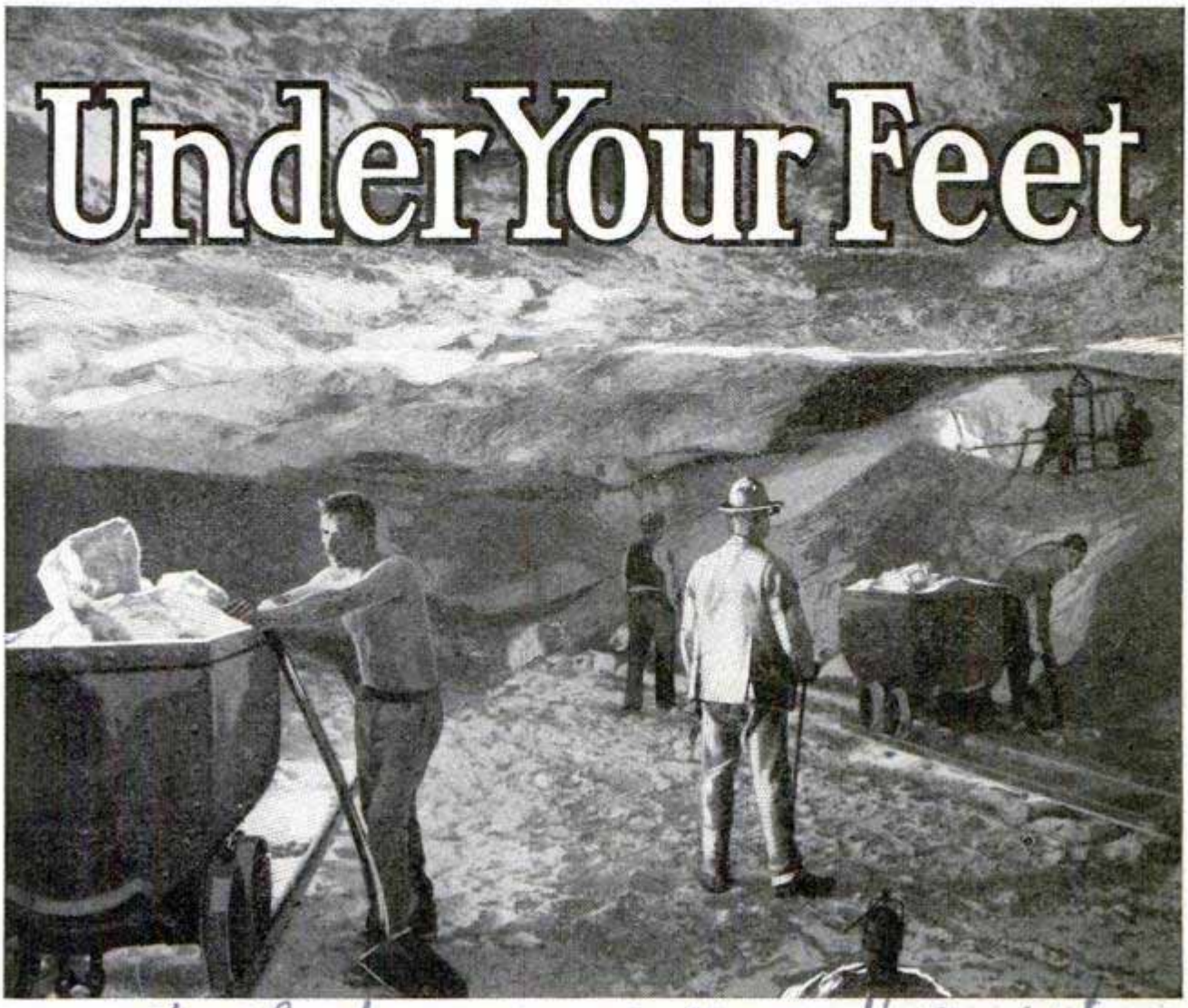
A few weeks ago, for example, a negro in South Australia reported finding some strange earth. When he threw it on a fire it "made a big blaze." Sir Douglas Mawson, noted geologist and explorer, heard of it. He found the strange earth to be part of a huge deposit of saltpeter, which is rarely found in a free state. Valued at $300 to $500 a ton, the beds of nitrate are worth a king's ransom.

Some months ago, Nevada and the country were thrilled with another gold discovery. Two boys were the lucky finders. Digging around a badger hole, within a hundred feet of a camp kitchen, they struck a rich bank of ore. It assayed $78,000 a ton, and in no time at all there was a real old-time gold rush to the Weepah field. But the boys knew gold ore when they saw it. They had lived on lean rations while prospecting for it.

Although the yellow metal is mostly found in well-defined areas, still "gold is where you find it." That applies to other valuable minerals. Did you know that ordinary folks have picked up valuable diamonds, hardest and most precious of minerals, in many different states? The sparklers have been found along the eastern base of the Appalachian range, in Virginia, North and South Carolina, Georgia, Alabama, and along the path of the glacial drift in Wisconsin, Michigan, Indiana and Ohio.

Other valuable gems have been picked

Under Your Feet



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Germany Mines Potash 3,000 Feet Below the Ground; the Photograph Shows the Broad Rooms and High Ceilings Which Are Typical of the Potash Veins

up by keen-eyed people in California, Idaho and Montana. In 1855, a laborer excavating in a street of Manchester, Va., came across the largest crystal ever found in this country. It weighed 23¾ carats, and even in that day brought thousands of pre-war "cartwheels."

Diamonds occur naturally only in volcanic formations. In South Africa, where the world's supply largely originates, they are found only in "pipes." These are shafts of unknown depth, more or less circular, topped off with a mound or "kopje" ten or twelve feet high. These deep chimneys have been filled with the crystal-bearing blue mud. Most of our best stones come from these pipes, believed to be volcanic in origin. South Africa has produced to date over a billion dollars' worth of diamonds. Small diamonds have been found in meteors, such as those which fell years ago in Tennessee.

In Pike county, Arkansas, a crater similar to the South African pipes was found some years ago. A farmer picked up a stone which seemed different from any he had ever seen. His wife was skeptical, but he took it to a jeweler, with another he picked up on the way. They were real gems, of fine quality. A limited supply has come from this and another nearby crater. The largest was six and one-half carats. The big steel-white gems of South Africa bring $2,000 to $3,000 a carat. No other such craters have been found in our land, but they may exist.

In new Transvaal diggings, Dr. Hans Merensky recently observed that gravel carrying diamonds also invariably contained fossil oyster shells. He bought a

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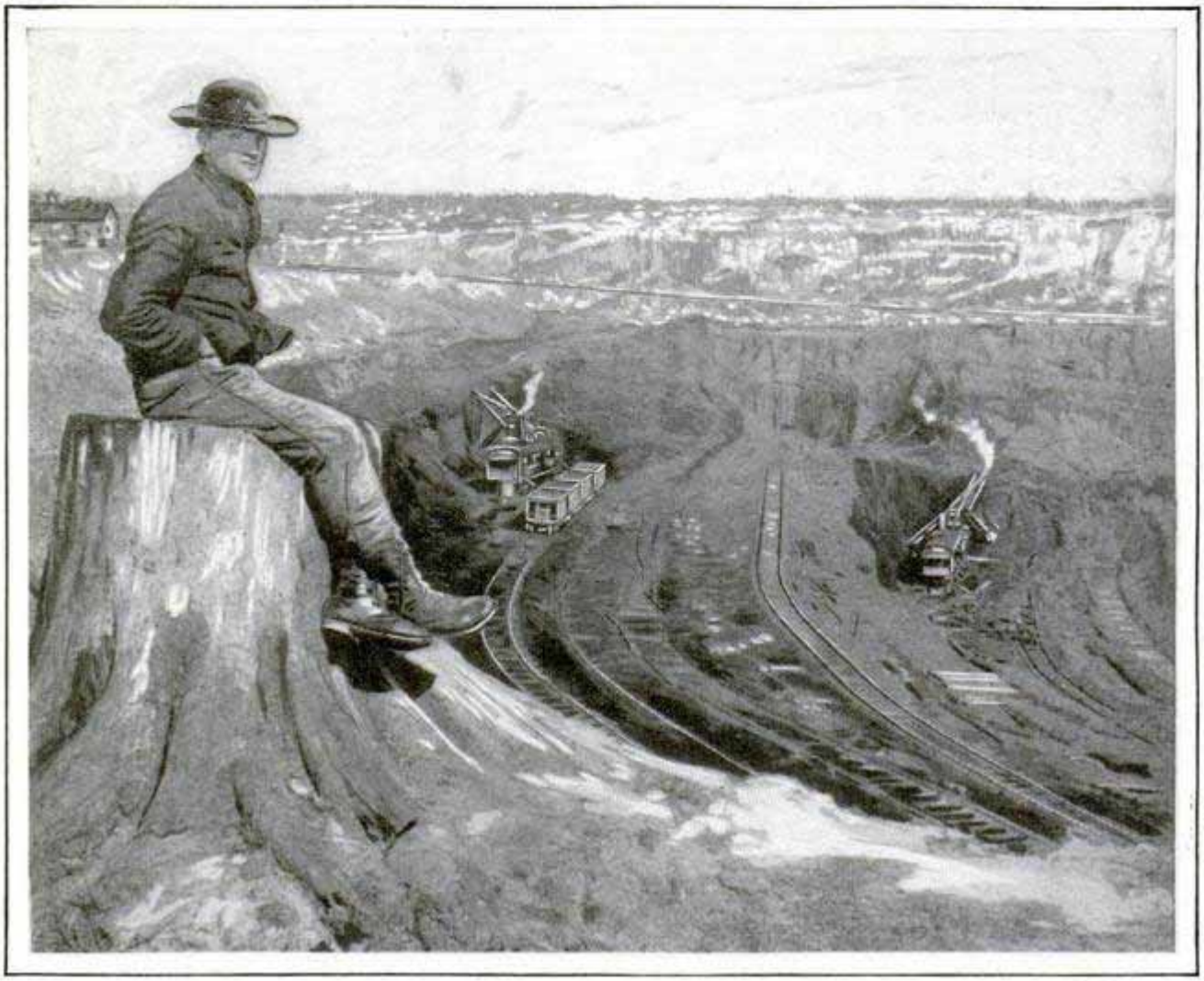

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Part of the Burt Open-Pit Mine, One of the Big Ore Producers of the Mesaba Iron Range, in Minnesota; This Mine Has an Output of 10,000 Tons of Iron Ore Daily

strip showing the shells and uncovered one of the richest diamond fields ever found. Keen eyes and judgment have brought many such fortunes. Brazilian fields were found by a card-playing priest, whose opponents used the white crystals as counters.

Black diamonds are scarcer than brilliants, and almost as valuable. They look exactly like sharp-cornered cinders from the ash can, from the size of peas to baseballs. If you find one of the latter size you should be worth $100,000 or so, assuming you start at zero. If very hard and largely free from defects, it would retail for over half a million dollars.

These black diamonds, entirely lacking in luster, serve as tough cutting edges for rock and steel drills; glass, fiber and pearl cutters, marble saws, and so on. So far, the world's output is found by naked natives in the wild interior of Brazil. The "carbonadoes" are mixed with gravel washed down from the mountains. They are never found alongside white gems, but in Pike county, Arkansas, a few have been picked up.

All "pretty stones" are worth investigating. It costs little to find out their value. A large piece of "colored glass" was recently found by an English workman along a railroad track. He gave it to his children to play with. By chance he saw a notice that a sixty-one-carat uncut ruby had been lost out of a passing railway coach. He rushed home, but could not find the stone. At last he uncovered it in a corner. It is said to have belonged to a former Persian ruler, and is of immense value.

Dr. George Kunz, gem expert of Tiffany's, has found and popularized many semiprecious stones formerly unknown and unwanted. Today a single "zircon" has brought $2,000. Fine tourmalines, first identified by Dr. Kunz, bring up to

5th Ave + 37th New York

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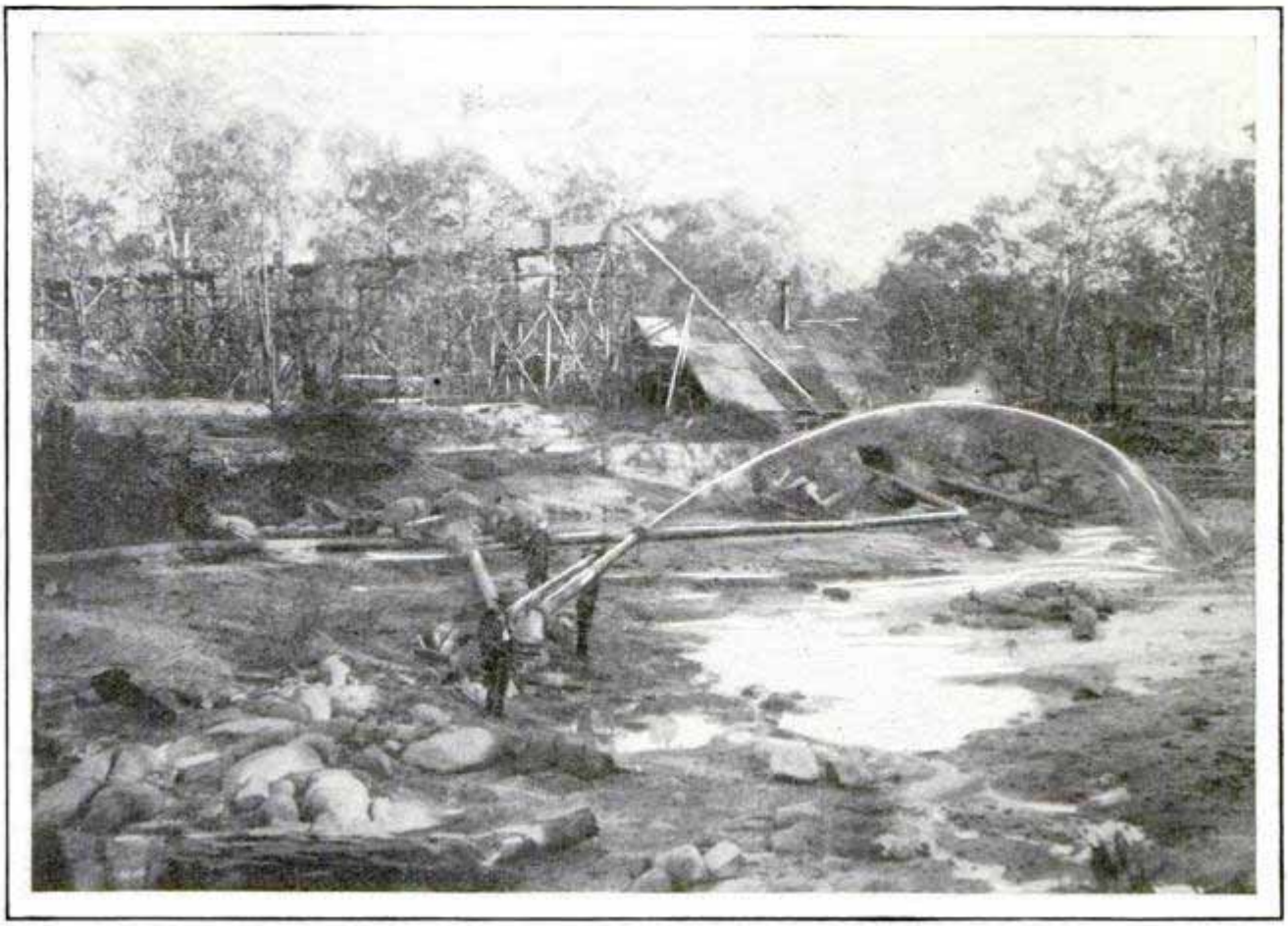


Placer Mining for Tin in New Zealand; More Than Five-Sixths of the World's Tin Is Found as Rolled Lumps and Grains in Alluvial Gravels, from Which It Can Be Washed

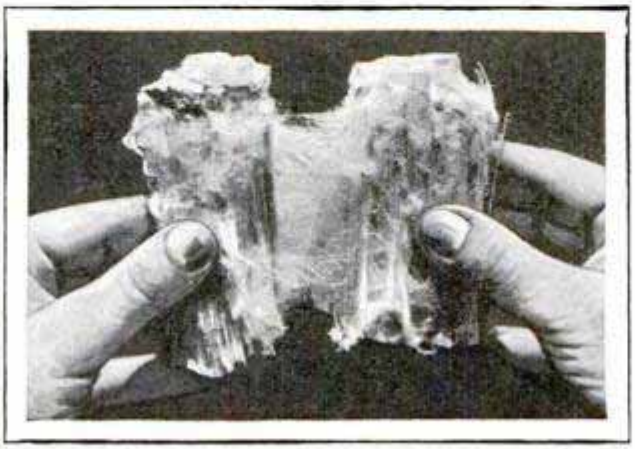
$100 a carat. In fifty years he has seen turquoise, sapphire, amethyst, coral, beryl and other such stones rise to very respectable prices.

Some of the oddest buried treasure in the world is found along the frozen Bering sea. It requires no technical skill to locate or to mine. For ages the natives had caught walruses and had reduced them to bones and gleaming white tusks.

These they tossed out on the dump back of their igloos. The piles accumulated, and they moved on. Then the white man came and eagerly bought ivory tusks, new or fossilized. The Eskimo is unearthing great deposits of the ivory, perfectly preserved. A single recent shipload from the Pribilof islands was worth over $75,000.

An even more everlasting material is asbestos. The curious mineral fibers, often soft and light as thistledown, are woven into fireproof garments and have a wide industrial use. Every steamfitter and engine operator uses it for packing around hot pistons and steam joints, and to retain heat in pipes and boilers. No other mineral has such properties. As a natural result, select high-grade fibers over two inches long have brought several thousand dollars a ton.

So far, these longer fibers, and even those around three-fourths of an inch, selling for $525 a ton, have been mined only in Canada. The immense open-pit mines near Quebec, with their cheap mining, furnish practically all the 250,000 tons imported into this country. In Canada the serpentine rock bearing asbes-



Fibers of Silky Asbestos as They Come from the Serpentine Rock; Two-Inch Fiber Sold for $4,000 a Ton

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tos occurs in ranges of small knolls, 100 to 1,000 feet high. Even up there the long fibers are scarce.

Asbestos has been found in Vermont, Wyoming, North and South Carolina, Virginia, Idaho, California and other states. Even Central park, New York, has some scattered veins. The mines at Sall Mountain, Ga., are the only ones being worked south of Quebec. But long seams are to be seen in the Grand canyon of the Colorado, at depths of over 4,000 feet below the rim. Here the fibers are said to be six to eight inches long, of a fine silky texture. But thirty to forty miles of burro packing to the railway renders the working of these seams impracticable for some time to come.

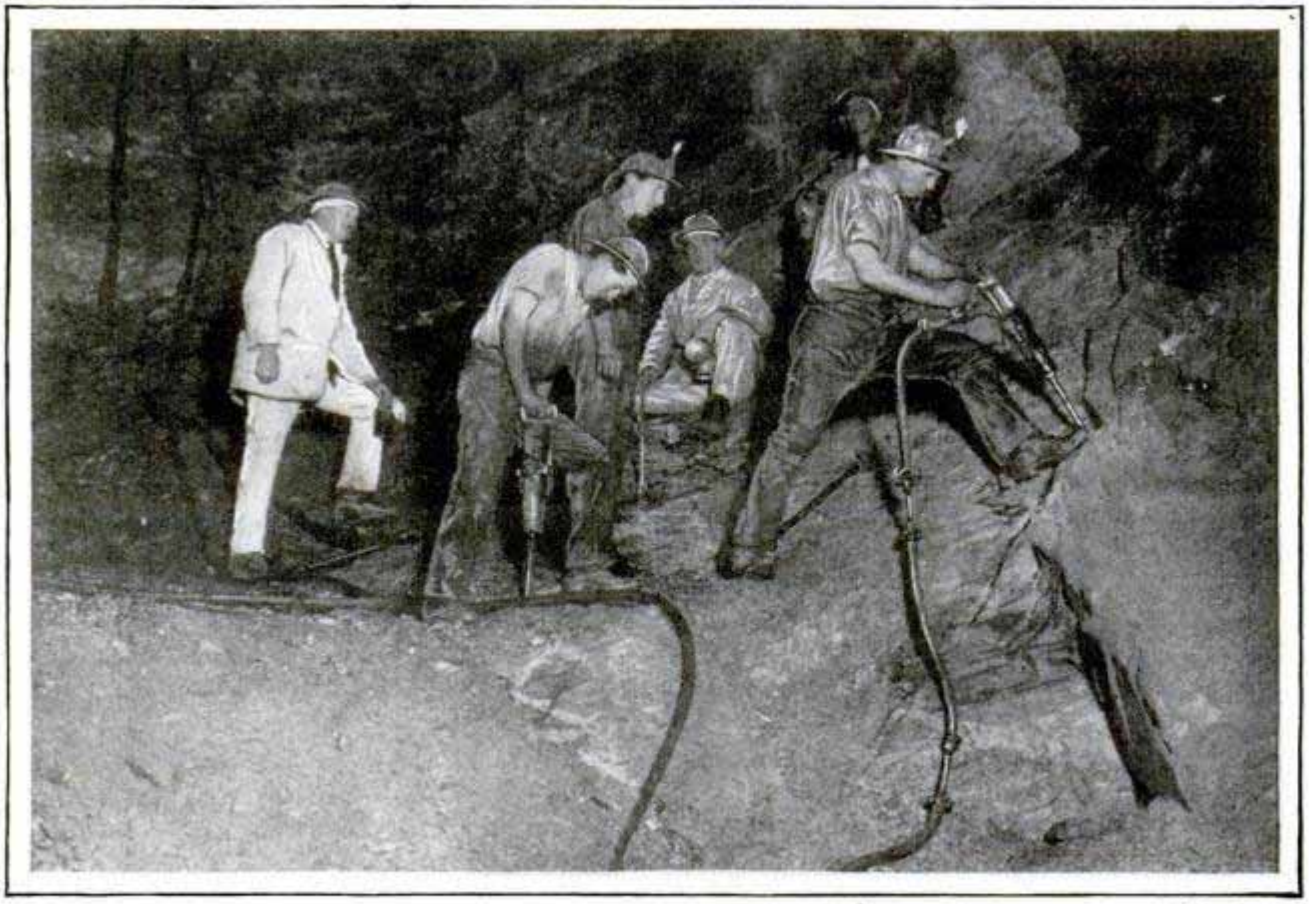
Clay deposits occur in almost every state. Brick of one grade or another can be made from most clays, but higher quality commands much better prices. Location near factory sites and not too far from markets have much to do with the value of clay banks, for clay products are heavy. Fine white porcelain clay, or kaolin, suitable for the best chinaware, is rarely found. Pottery plants and university departments of ceramics will give information as to the uses of clays.

There is an infinite number of valuable minerals, from marble, slate and building stones, coal, iron ore, gypsum, to salt, borax, epsom salts, glass sand and asphalt. Only one locality furnishes slate of quality high enough for use in the manufacture of electrical switchboards.

Many treasures worth fortunes will be uncovered and marketed in years to come. Industry demands increasing quantity and variety of materials. Substitution is common as competition grows ever keener. Cheaper materials constantly replace more expensive ones.

Senator Tasker L. Oddie, of the mining state of Nevada, said recently: "Since the beginning of complete record, in 1880, the total value of output of minerals in the United States is nearly $100,000,000,000. While holding firmly the leadership of the nations in the production of minerals, the United States yet lacks adequate supplies of a few highly essential minerals, such as tin, platinum, potash, nickel, chromium, antimony and nitrates."

Here, then, are some scattering exam-



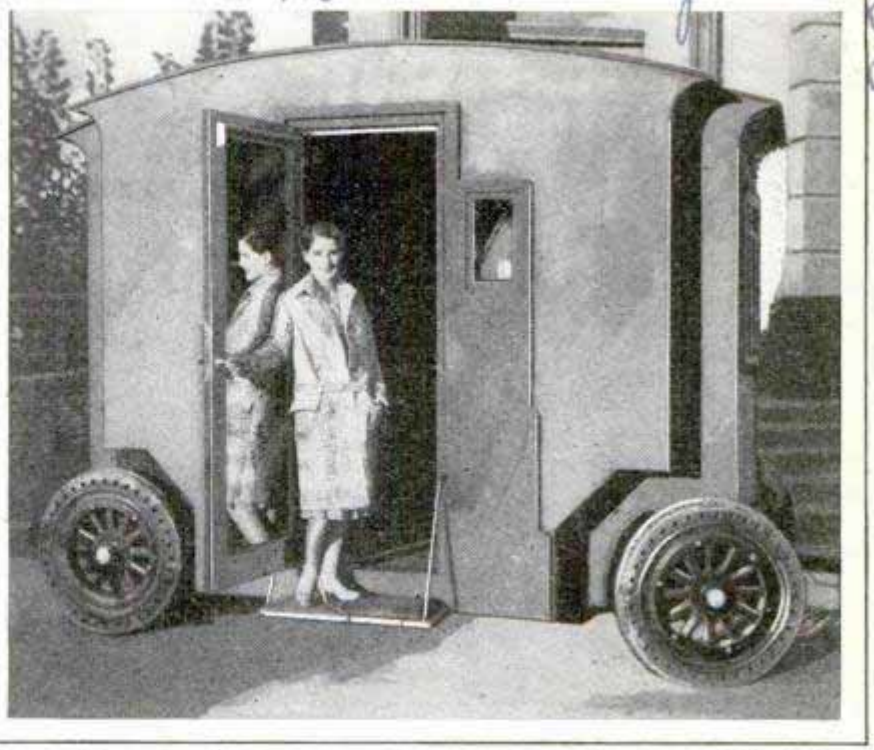
© Keystone

Drilling Tin Ore in Cornwall, England, Where the Romans Operated Mines in Caesar's Time; Vast Quantities of Arsenic Are Recovered as a By-Product in Melting the Ore

ples of the treasures which lie under our feet, waiting for us to discover and market, and perhaps to find new uses for them. They offer no smoothly paved road to wealth—but a rough path is better than no road at all.

WEIGHING BY RADIO

Based on the principles of a radio-receiving set, an apparatus has been developed that accurately weighs such materials as paper, rubber, coated fabrics or other substances that pass through it in a continuous web. An important element in the process is the employment of a tuned radio circuit. The material passes between two parallel metal plates which act as a condenser in the receiving circuit. Variations in the weight of the web, change the capacity of the condenser and affect the response of the circuit. These variations are shown on a meter.



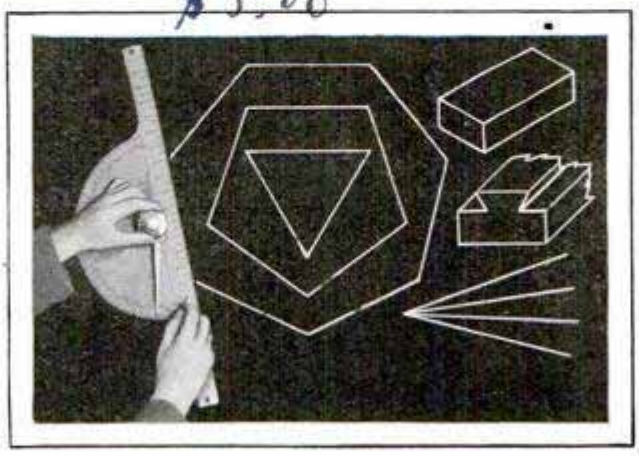
Norma Shearer in the Doorway of Her Portable Dressing Room, Which Saves Time and Trouble While Filming a Picture

DRESSING ROOMS ON WHEELS SERVE MOVIE STARS

Portable dressing rooms have been introduced in the Hollywood studios for the convenience of the stars and to save time on productions. They are mounted on an automobile chassis and are pulled about by a small tractor. Wardrobe space, tables, chairs and an electric refrigerator, are afforded in the traveling rooms.

GRAVITY-GUIDE DRAWING RULE PROMOTES ACCURACY

To simplify the task of making accurate drawings on a blackboard, a guide has been introduced that has an arrow pointer, governed by gravity, to assist in the correct formation of angles. The unit is a ruler and protractor scale combined. To draw the angle required, the guide is moved sideways until the arrow points opposite the degree desired. A knob in the center simplifies the handling of the guide, and it can easily be adapted for many special tasks both at the blackboard in schools and at the draftsman's desk.



Arrow on Ruler Falls to Desired Angle Setting When Guide Is Slanted Correctly for Accurate Drawing

COIN-IN-SLOT CIGAR VENDER FOILS CHEATING

Two cigars and a box of matches are delivered to the purchaser from a coin-in-the-slot vending machine which is so arranged that it will not work unless the proper coin or coins are deposited. There are slots for quarters, nickels and dimes, but the various coins will not operate the machine if put in the wrong slots and dimes and nickels will be returned.

Paper Spats Adjusted, and in Background a Close View of One of Them, Showing the Form

PAPER SPATS SHIELD STOCKINGS AND KEEP OUT COLD

Paper spats that can be adjusted in a second or two and are almost as durable as cloth have been introduced to protect women's stockings from mud spatters. They guard the shoe and reach up high enough to shield the area most likely to be stained. In addition, they add considerably to the wearers' comfort on cold and wet days.

SMOKE ROBS CITIES OF SUN NEEDED FOR HEALTH

The smoke pall that hangs over the average American city cuts off as much as forty-two per cent of daylight on sunny mornings, and as high as eighteen per cent at noon, according to a survey made by the U. S. public health service. Besides lessening the sunlight that reaches the earth, it also stops a large portion of the ultraviolet rays which are so necessary to good health. The survey, made in several representative cities, showed the most serious losses in winter, and the least in June. The smoke pall is usually heaviest in the early morning and late afternoon, and least in the middle of the day.

OLD MINERS' PAN REPLACED BY CENTRIFUGAL SEPARATOR

To take the place of the familiar pan in separating gold from sand and gravel, a whirling bowl devised by a Nebraska man is operated on the same principle as a cement mixer or a cream separator. A revolving screen removes the coarse gravel before the material is run into the bowl itself. This is fitted with grooves that retain the heavy gold particles as the container turns. The outfit is operated by a small engine and there is a pump to furnish water. A small unit will handle from twenty to thirty tons of material a day.

"GUN" WASHES AND BRUSHES CARS IN TWO MINUTES

Motor busses at an English station are thoroughly washed in a few moments with the aid of a combined brush and water-spray gun. Electric pumps force the water out at a pressure of 3,000 pounds to the square inch and the operator can regulate the stream to form a fine spray or a direct flow, as he desires. The exterior of the car can be cleaned very quickly, and water reaches parts that would be slighted in ordinary washing.

© London Underground Railroad

Quick Cleaning for London Busses; Water Is Forced through the "Guns" by Electric Pumps

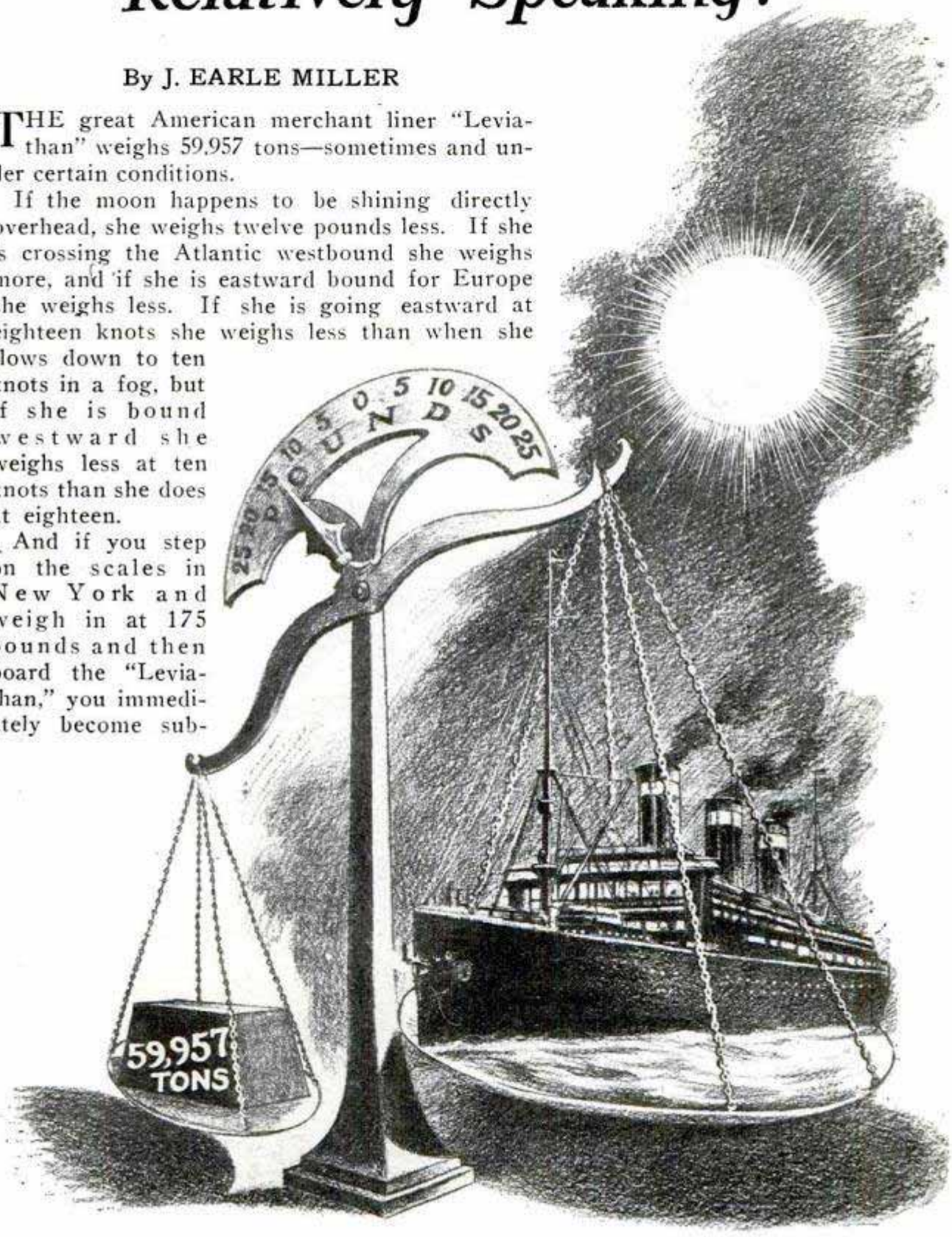
What Do You Weigh — *Relatively Speaking?*

By J. EARLE MILLER

THE great American merchant liner "Leviathan" weighs 59,957 tons—sometimes and under certain conditions.

If the moon happens to be shining directly overhead, she weighs twelve pounds less. If she is crossing the Atlantic westbound she weighs more, and if she is eastward bound for Europe she weighs less. If she is going eastward at eighteen knots she weighs less than when she slows down to ten knots in a fog, but if she is bound westward she weighs less at ten knots than she does at eighteen.

And if you step on the scales in New York and weigh in at 175 pounds and then board the "Leviathan," you immediately become sub-



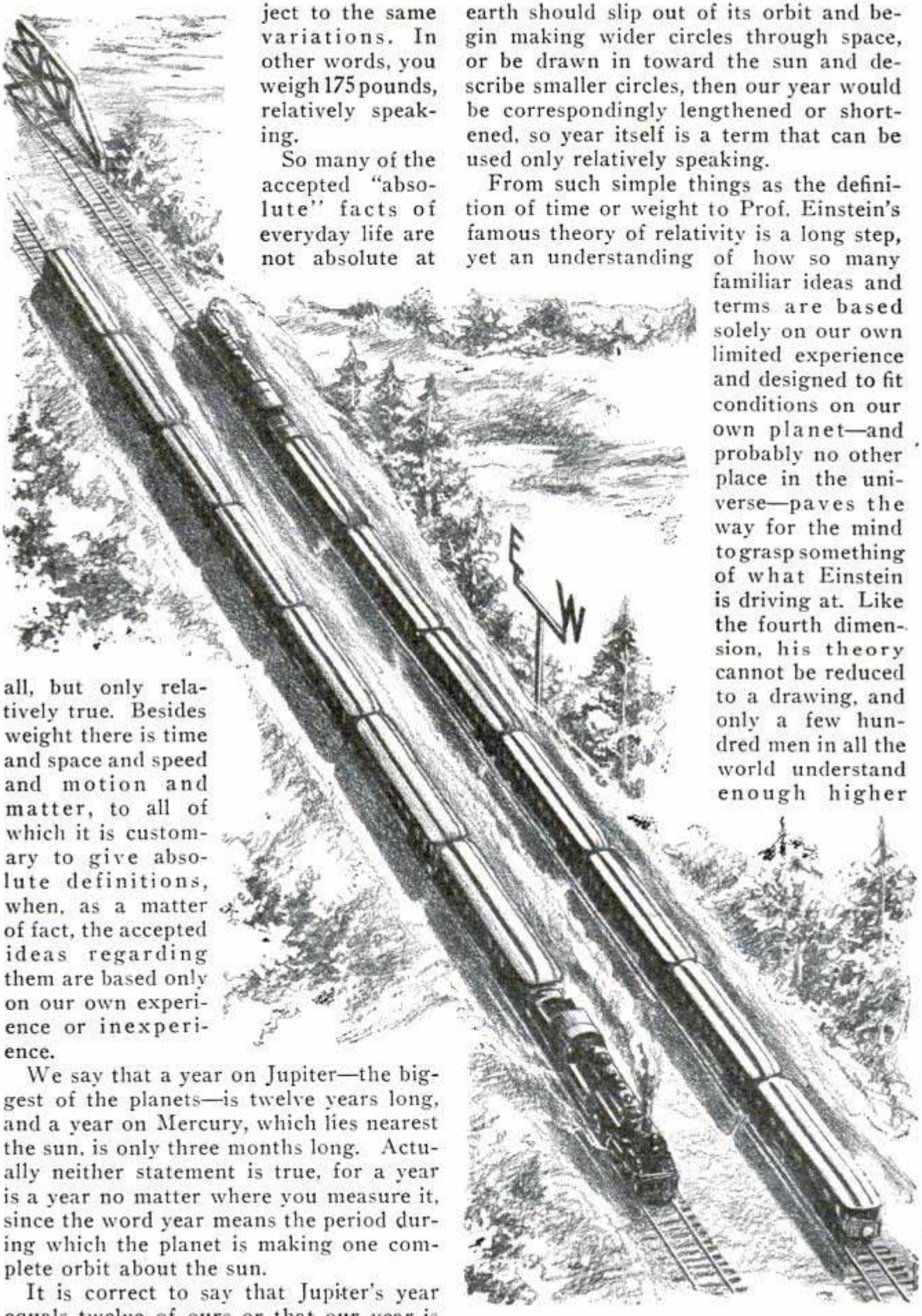
When the Man in the Moon Shines Down from Overhead on the Nearly 60,000 Tons of the Liner "Leviathan" the Great Ship Loses Twelve Pounds of Its Supposed Weight

all, but only relatively true. Besides weight there is time and space and speed and motion and matter, to all of which it is customary to give absolute definitions, when, as a matter of fact, the accepted ideas regarding them are based only on our own experience or inexperience.

We say that a year on Jupiter—the biggest of the planets—is twelve years long, and a year on Mercury, which lies nearest the sun, is only three months long. Actually neither statement is true, for a year is a year no matter where you measure it, since the word year means the period during which the planet is making one complete orbit about the sun.

It is correct to say that Jupiter's year equals twelve of ours or that our year is equal to four of Mercury's years. If our earth should slip out of its orbit and begin making wider circles through space, or be drawn in toward the sun and describe smaller circles, then our year would be correspondingly lengthened or shortened, so year itself is a term that can be used only relatively speaking.

From such simple things as the definition of time or weight to Prof. Einstein's famous theory of relativity is a long step, yet an understanding of how so many familiar ideas and terms are based solely on our own limited experience and designed to fit conditions on our own planet—and probably no other place in the universe—paves the way for the mind to grasp something of what Einstein is driving at. Like the fourth dimension, his theory cannot be reduced to a drawing, and only a few hundred men in all the world understand enough higher



Identical Trains, Passing in Opposite Directions, Yet One Weighs Less Than the Other

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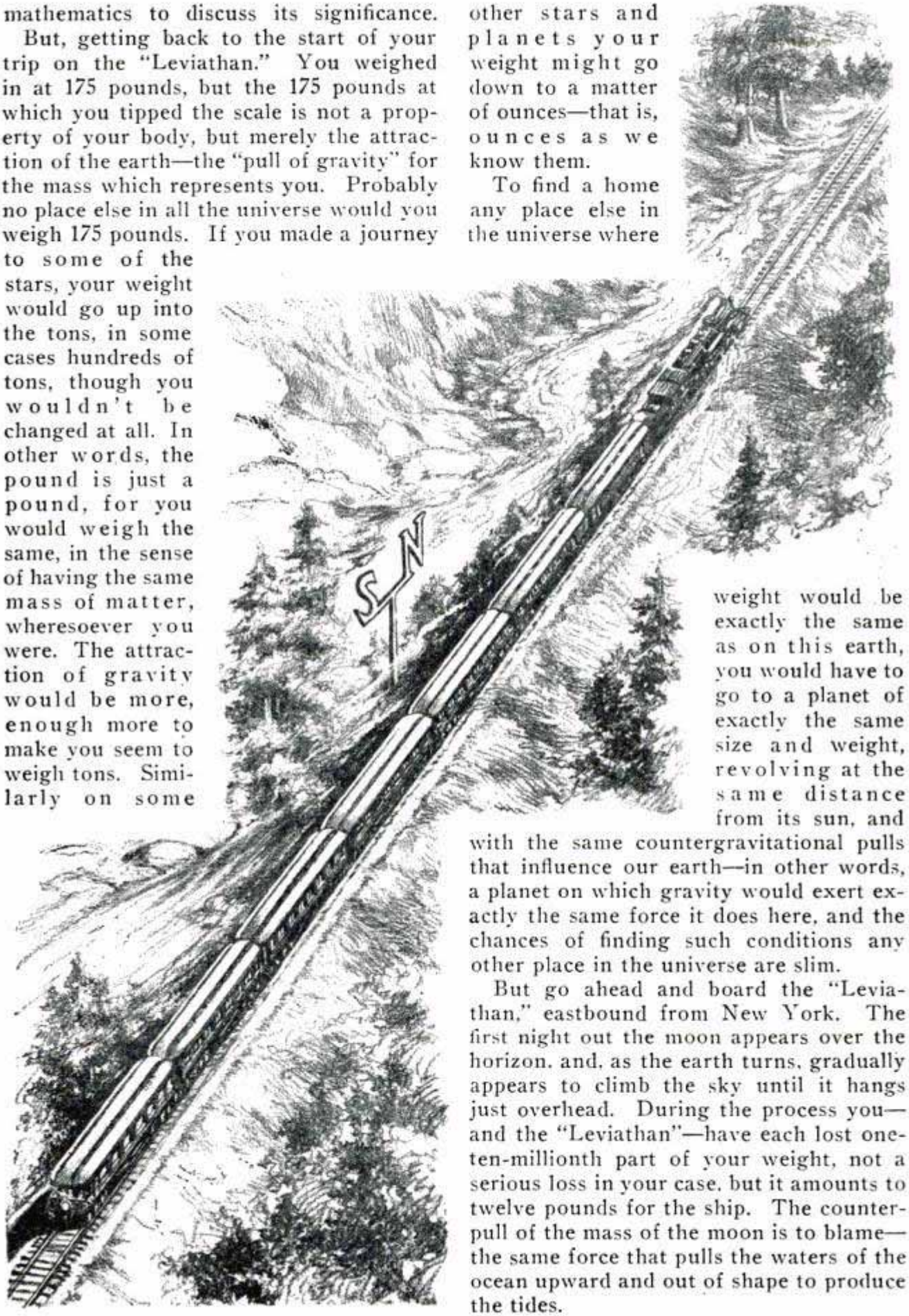
mathematics to discuss its significance.

But, getting back to the start of your trip on the "Leviathan." You weighed in at 175 pounds, but the 175 pounds at which you tipped the scale is not a property of your body, but merely the attraction of the earth—the "pull of gravity" for the mass which represents you. Probably no place else in all the universe would you weigh 175 pounds. If you made a journey to some of the stars, your weight would go up into the tons, in some cases hundreds of tons, though you wouldn't be changed at all. In other words, the pound is just a pound, for you would weigh the same, in the sense of having the same mass of matter, wheresoever you were. The attraction of gravity would be more, enough more to make you seem to weigh tons. Similarly on some other stars and planets your weight might go down to a matter of ounces—that is, ounces as we know them.

To find a home any place else in the universe where weight would be exactly the same as on this earth, you would have to go to a planet of exactly the same size and weight, revolving at the same distance from its sun, and with the same countergravitational pulls that influence our earth—in other words, a planet on which gravity would exert exactly the same force it does here, and the chances of finding such conditions any other place in the universe are slim.



Why Does the West Rail of a North and South Railroad Line Get the Most Wear?

But go ahead and board the "Leviathan," eastbound from New York. The first night out the moon appears over the horizon, and, as the earth turns, gradually appears to climb the sky until it hangs just overhead. During the process you—and the "Leviathan"—have each lost one-ten-millionth part of your weight, not a serious loss in your case, but it amounts to twelve pounds for the ship. The counter-pull of the mass of the moon is to blame—the same force that pulls the waters of the ocean upward and out of shape to produce the tides.

It being a clear, moonlight night, the ship is proceeding at full speed, but before

dawn fog blankets the sea and she slows down. Now she weighs more than she did when running with throttle wide open.

A more familiar illustration of the reason for that is the old catch question why a train bound, say, from Chicago to New York, weighs less than the same train, of exactly the same weight when standing still, weighs when westbound from New York to Chicago. You have to go back to centrifugal force, a common phenomenon, for the explanation. In its simplest demonstration centrifugal force is the power that keeps water in a pail when you whirl it over your head, the power that causes objects revolved rapidly to try to fly away from the center, in defiance of the laws of gravity. A flywheel, revolving rapidly, may burst from the strains of centrifugal force, and the pieces will fly high and far. If they could keep the speed at which they started at the moment of bursting they would never come back to earth, but go sailing off through space entirely free from the pull of gravity, and, therefore, having no weight, since weight is not a property of the mass itself but merely the pull exerted by the mass of the earth.

Now, go back to the eastbound train. Standing still, it weighs, let us say, a thousand tons. It pulls out of the Chicago station and starts east, in the same direction in which the earth is revolving. Imagine that, instead of being limited to sixty or seventy miles an hour, its speed could keep on increasing and increasing until, like the bursting flywheel, it reached a speed at which it would overcome the pull of gravity and go hurtling off into space. At the instant it left the rails, it would cease to have any weight, for gravity would have ceased to pull it. But it didn't lose all that thousand tons of weight in one moment. Instead, from the moment it began to move, it was losing weight, more and more as its speed increased, until eventually it had no weight. The loss of weight was a property of increased speed. Standing in the station, the train itself was not moving, but the earth was turning at something over a thousand miles an hour, surface speed, at the equator, and at something less than that in the latitude of Chicago. So the train, while standing still in the station, was actually moving through space at, let us say, about 800 miles an hour. Leaving the station it speeds up to sixty miles an hour, measured on the earth's surface, but its speed through space is sixty miles plus the earth's speed, or 860 miles.

The same train, going west, is moving in the opposite direction to the rotation of the earth, and, the faster it goes westward, the less its actual speed through space. At sixty miles an hour its speed through space has fallen to 740 miles, and its weight has correspondingly increased, since the tendency to fly off into space through complete loss of weight is correspondingly less.

It isn't often that the speed of the earth's rotation has to be taken into account in planning things on earth, but there are some notable examples. One is the fact that the west rail of a north-and-south railroad track has the hardest wear and will, in the normal course of events, give out first. If you have ever stood in a moving street car, railway train or other vehicle, facing at right angles to the direction of movement, you have found yourself putting more weight on the foot toward the rear, than on the forward one. The tendency of your body to remain stationary instead of moving through space with the vehicle, in other words, the inertia of the body, is to blame. When the railroad track runs north and south, the train is affected in the same way, trying to resist the movement of the earth's surface at several hundred miles an hour toward the east, and, consequently, there is more of the train's weight on the west rail than there is on the east. The human body is affected the same way when walking either north or south, but the unbalancing of weight is so slight that it is not noticeable. A train weighing a thousand tons or more, however, is affected sufficiently to shorten the life of the west rails.

When the Germans fired their long-range cannon on Paris, they had to make very intricate calculations to allow for the changing position of Paris during the minutes the shell was in flight. If a shell, fired from east to west, had a muzzle velocity equal to the speed of the earth's rotation in the latitude in which it was fired, it would, in effect, be standing still in space waiting for its target to come along beneath it. If the German gun, instead

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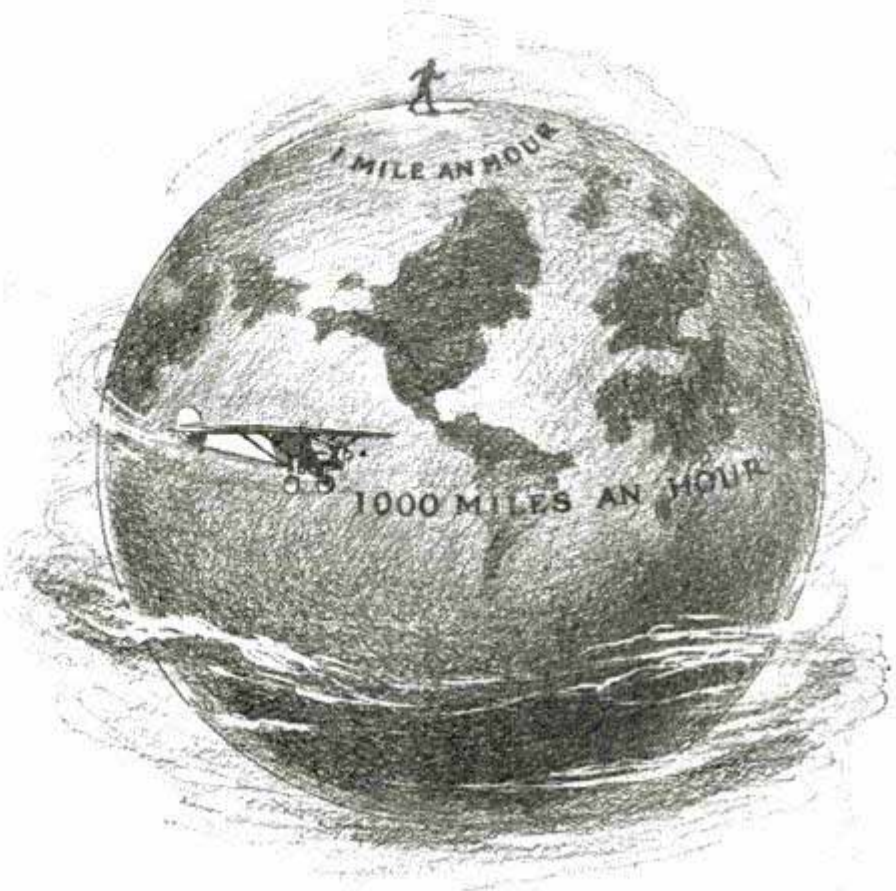
of being used on earth, had been moved to the moon, its range, instead of being seventy-five miles, would have been 2,250 miles, or one-quarter of the moon's circumference. If the gunner used an elevation of about four degrees, he could fire a shell entirely around the moon and hit himself in the back, according to calculations by Dr. F. E. Wright of the Carnegie institution.

The reason lies in the fact that the moon, with a much smaller mass, has but about one-sixth of the earth's gravitational pull, in fact the moon is too weak to even hold an atmosphere on its surface. An ordinary seventy-five-millimeter field-gun, with a range of five to eight miles on earth, would shoot 230 to 280 miles on the moon. If the familiar craters of the moon are really of volcanic origin, Dr. Wright points out, the moon's weak gravitational force, together with the absence of wind and water to corrode, explains their peculiarly rugged and clean-chiseled appearance, for all the material thrown out by the volcanic explosion would be hurled so far away that none could fall back into the pit. Put in the familiar terms of weight the stone and iron and other material expelled from the craters would weigh but about one-sixth what the same material would weigh on our earth, though actually its structure would be the same.



If the Man a Little More Than Seven Miles from the Pole, and the Flyer at the Equator, Both Stop for One Day, What Is Their Relative Speed?

Time is another of the familiar facts that is only relatively true. One interpretation of a mathematical equation is that time varies with speed. Carried to its logical conclusion, the idea means that a perfectly accurate clock, if traveling through space with the speed of light, would not show that any time had elapsed. The argument by which higher science arrives at the result is, to the lay mind, fantastic, but some of the other logical conclusions are not so hard to reconcile with facts that we accept without difficulty.

Take the old trick question regarding the age of the man, born in Chicago, who, some time during his life, moves to New York, and dies there. Obviously there is a discrepancy of an hour between his apparent and his actual age, for, if he dies at noon in New York, it is only 11 o'clock in Chicago, and hence he is really one hour younger than his apparent age, based on New York time. Or reverse the process and he is one hour older.

Now take the case of a person who makes a trip around the world. If he goes in one direction he loses a day, and if he goes in the other he gains a day. In a normal year of 365 days the circumnavigator who goes west with the sun gains a day in mid-Pacific and actually lives 366 days in the year, while the eastbound traveler loses a day in the same place, and so has 364 days that year. Carrying the example farther, if the traveler in his lifetime makes 365 round trips around the world, always in the same direction, his apparent age at the time of death must actually be one year wrong—he is either one year older or one year younger.

Even the passenger in an automobile going west or east is slowing down or speeding up time, living faster or slower, as the case may be. If he drives westward and crosses from one time zone into another during the day he is living slower, for he crowds twenty-five hours into a twenty-four-hour day, and if he travels east, he lives faster, for his day is but twenty-three hours long.

That is easily understood, but when the mind travels along the pathway toward Einstein's relativity the theory becomes more complex. For example, time moves more slowly in a moving automobile than in one standing still, for time varies with speed. Outside of the realms of higher mathematics that concept is almost impossible of explanation. The best way is to admit we have no conception of what time really is, and cannot possibly describe it.

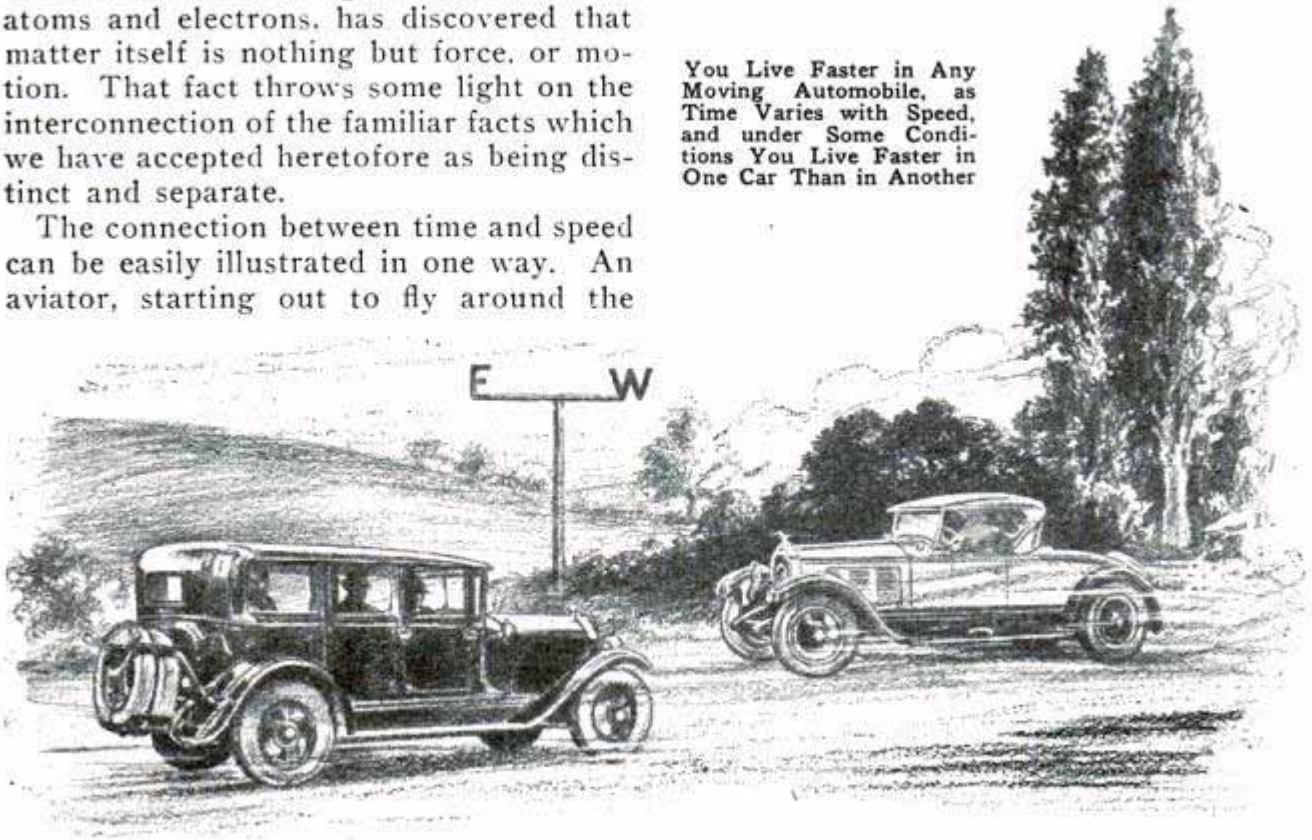
The trouble is that the purely relative definitions of time, space, motion and matter that have been accepted for everyday use, within the limitations of our own experience and own world, fail to take into consideration the necessities of the entire universe. That one of the four might possibly be converted into one of the others, is not reckoned on, for they are usually considered as separate things.

Science, in reducing the elements to atoms and electrons, has discovered that matter itself is nothing but force, or motion. That fact throws some light on the interconnection of the familiar facts which we have accepted heretofore as being distinct and separate.

The connection between time and speed can be easily illustrated in one way. An aviator, starting out to fly around the earth, following the equator, and wanting to complete the journey in one day, would have to attain an average speed of more than 1,000 miles an hour. A pedestrian, standing slightly more than seven miles from the North Pole, could walk around the world in one day by averaging a mile an hour. But imagine the aviator at the equator remaining in his camp and the pedestrian near the pole sitting in his igloo for twenty-four hours. The one has moved through space at the speed of more than a thousand miles an hour and the other at the speed of a mile an hour, as the earth rotated on its axis, yet both have traveled for the same time at the same apparent speed, since neither moved.

Going back, finally, to the problem of weight and gravitation. Newton's theory of the attraction of the earth for the apple was so sensible that everyone accepts it without question. Yet no one has ever seen this force, and no apparatus has ever been invented that will reveal any attraction. Gravitation is just a name for one of our sensations. Einstein himself, in one of his lectures, told a story that set forth how ignorant science is of the actual nature of this attraction.

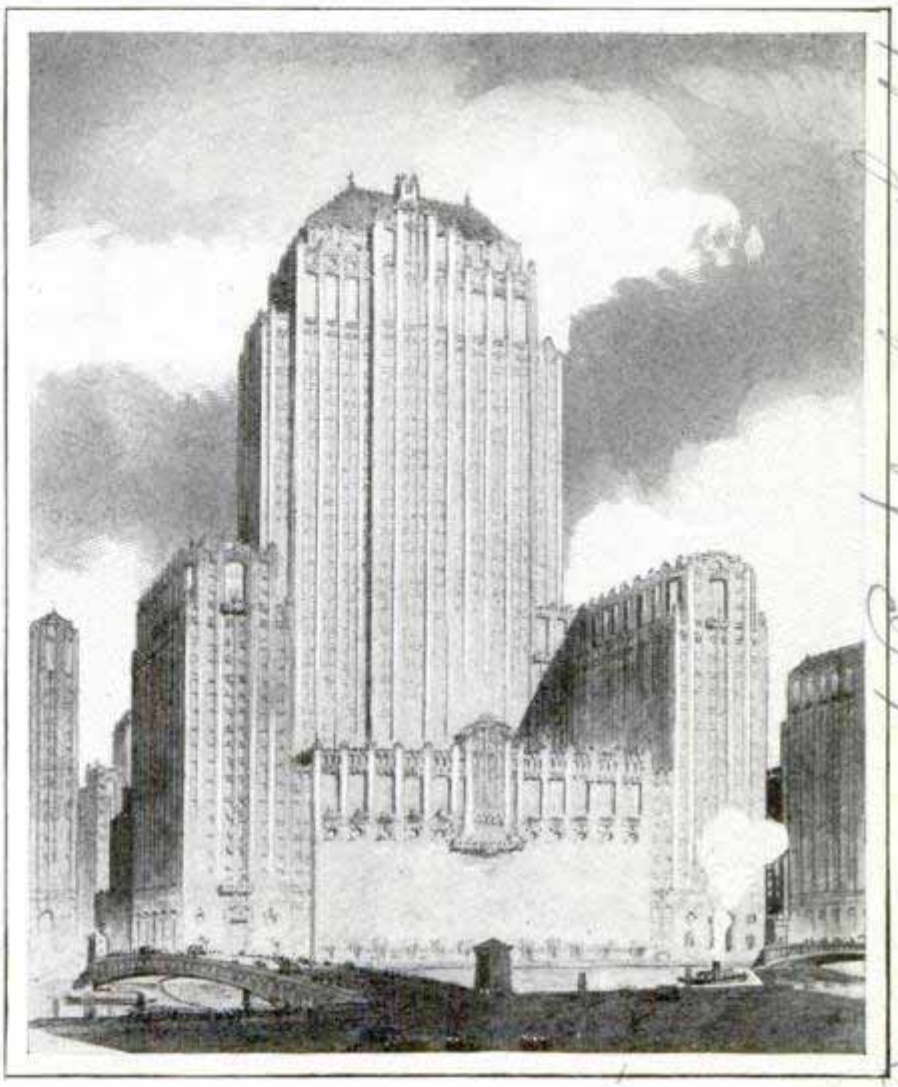
He proposed that the audience imagine a man inclosed in a perfectly dark cage, poised, motionless, far out in interstellar



You Live Faster in Any Moving Automobile, as Time Varies with Speed, and under Some Conditions You Live Faster in One Car Than in Another

space. The man would not weigh anything and he could move freely about the cage from side to side or from top to bottom, since there would be no attraction to hold him down, or, if he desired, he could simply float in the cage without touching it. Next imagine that, unknown to him, a cable is attached to the top of the cage and some strong force begins pulling on the cable, drawing the cage swiftly upward, the force being so steady and noiseless that it would remain unsuspected by the man.

What would his sensations be? He would suddenly find himself drawn against the bottom of the cage, and only by a strong effort could he jump momentarily free of it. An outside onlooker could see that the bottom of the cage was being drawn upward toward the man, but the latter would never suspect this. For all we know, Einstein explained, the apparent attraction of the earth, which we call gravitation and which expresses itself as weight, may be merely a new and undiscovered form of motion.



© Twenty Wacker Drive Building Corp.

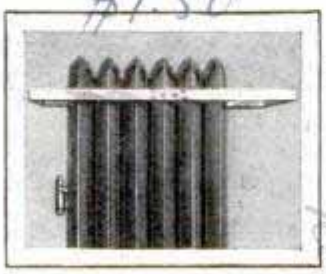
Architect's Drawing of the Proposed Home for Chicago's Civic Opera Company, to Cost, with the Land, $20,000,000

FORTY-TWO-STORY STRUCTURE TO HOUSE OPERA

Construction has begun on a permanent home for grand opera in Chicago. With the land, it will cost about $20,000,000 and will include a smaller theater, besides stores and offices. The main structure will be twenty-one stories high. In the center will be a tower with twenty-one additional stories, 550 feet high, and the equivalent of two and three stories will go below the street level. The opera house will have 3,600 seats and thirty-six boxes. A feature will be an "omnibus" box for men unaccompanied by women. Stage facilities will be arranged to permit more rapid changes of scenes than are possible with existing equipment. The prompter's box will also accommodate the men who control the lights, so that there will be greater co-operation between them.

FOLDING DRIER FOR RADIATOR LATEST TRAVELING AID

Drying a small washing by the radiator is simplified with a folding rack invented by a woman. It consists of an arrangement of rods which are easily attached to the radiator and hold the garments so as to prevent scorching or soiling. The rack folds up in small space when not in use, for convenient carrying.



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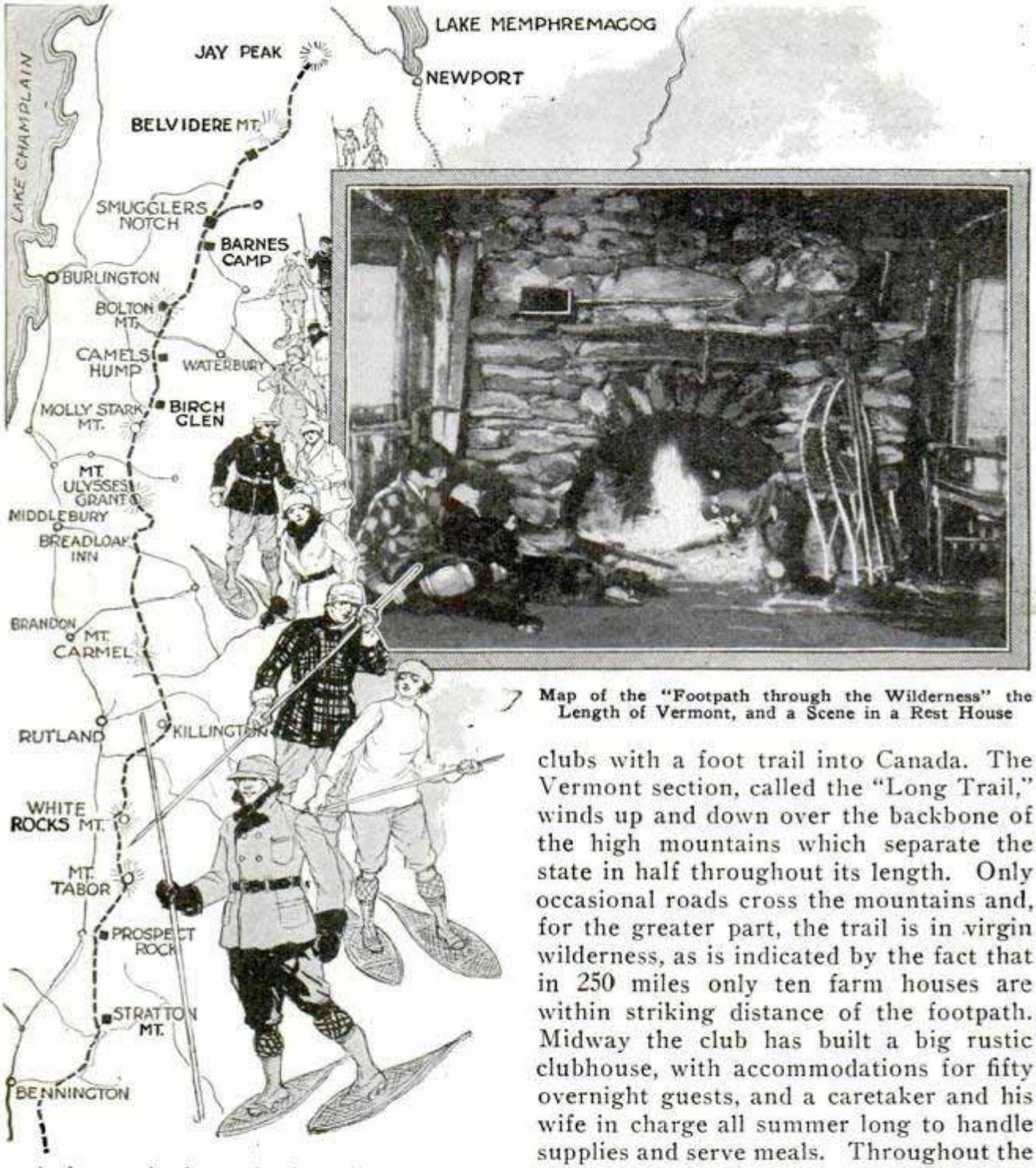
MOUNTAIN CLUB BUILDS FOOTPATH IN WILDERNESS



Map of the "Footpath through the Wilderness" the Length of Vermont, and a Scene in a Rest House

A footpath through the wilderness, including nearly 250 miles of forest trail, has been completed in the Green mountains of Vermont by the Green Mountain club as the first link in a chain of hikers' paths that will reach down through the White mountains and the Appalachian range as far as northern Georgia. The first section, stretching from within a few miles of the Canadian line down the length of Vermont to the Massachusetts line, is being connected by Montreal trampers' clubs with a foot trail into Canada. The Vermont section, called the "Long Trail," winds up and down over the backbone of the high mountains which separate the state in half throughout its length. Only occasional roads cross the mountains and, for the greater part, the trail is in virgin wilderness, as is indicated by the fact that in 250 miles only ten farm houses are within striking distance of the footpath. Midway the club has built a big rustic clubhouse, with accommodations for fifty overnight guests, and a caretaker and his wife in charge all summer long to handle supplies and serve meals. Throughout the trail, at intervals of six to eight miles, are shelter houses, with bunks.

Dur. Proctor, Vt.

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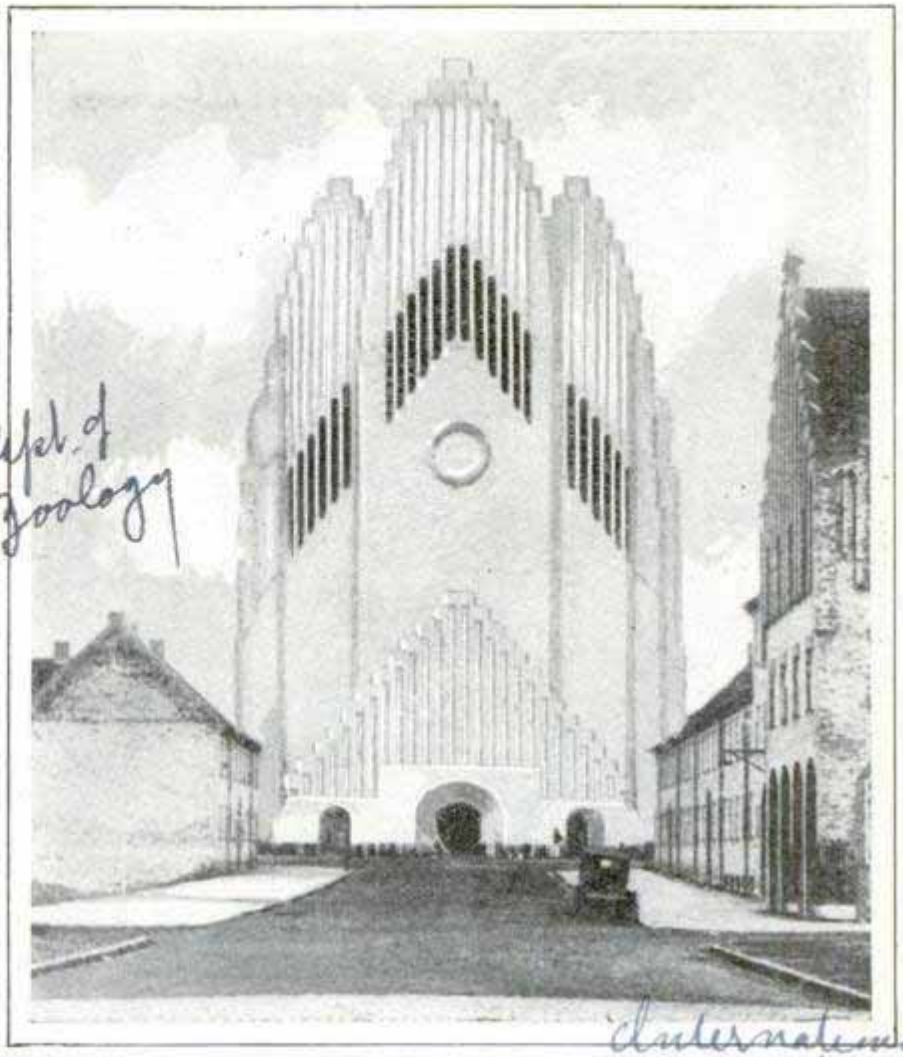
FIREPROOF LINOLEUM

Introduction of a kind of linoleum that is almost incombustible, cheap, easy to handle and durable, has been announced in England. When it is heated to a high temperature, a chemical in it gives off a gas which stays close to the floor, cuts off the air supply and so smothers the blaze.

Cont. George H. Holden
Nat. air quarbet 9/4/28

ARE MICE SMARTER THAN MEN?

The brain of a mouse constitutes five per cent of its body; the brain of a human being but two per cent. Are mice smarter? Interesting findings concerning the relative intelligence of different kinds of animals have been made by Prof. George H. Parker, of Harvard university. He declares that, at night, a mouse is often sharper than a human being, but its daytime intelligence cannot be compared with that of a person. Sea anemones, jellyfish, coral animals, starfish and sea urchins have no "minds" at all, the professor concludes, after many experiments with these creatures. Dogs are better at obeying orders than cats but the cat more often gets what it wants. However, the two cannot be fairly compared, Prof. Parker says, as each outshines the other in some particular. It is likewise impossible to establish a definite scale of animal intelligence, although the chimpanzee is the most intelligent and the chicken among the least.



Architecture Takes a Lesson from the Pipe Organ; Front of Odd Church Recently Completed in Denmark

CHURCH SHAPED LIKE ORGAN BUILT IN DENMARK

Danish architects have introduced a novelty in church architecture in a structure that resembles a huge pipe organ. In place of the usual steeple effect, the front is made up of tall, cylindrical forms like those of the organ. The arrangement also permits changes in design of the windows.

TRANSIT AND LEVEL COMBINED TO AID BUILDERS

Greater simplicity in adjustment is the chief feature of a transit-level that has been devised, especially for surveys on buildings and sites. It can be changed from a level to a transit or vice versa without lifting or fixing any parts. This eliminates the danger of dropping the telescope or replacing it in reverse.

ARTIFICIAL DAYLIGHT FOR BIRDS BENEFITS ZOO SPECIMENS

Special artificial lighting has been introduced at the London zoological gardens for the benefit of tropical birds that do not thrive well in the natural light of gloomy winter days and are injured by too bright a glare from ordinary lamps. The illumination provides a mild, diffused glow that not only helps the birds but makes it possible to take photographs of the specimens with greater ease.

Close View of the Trimmer, Showing the Block-and-Tackle Rig and Cutter as Though in Use

BLOCK-AND-TACKLE TRIMMER EASES PRUNING TREES

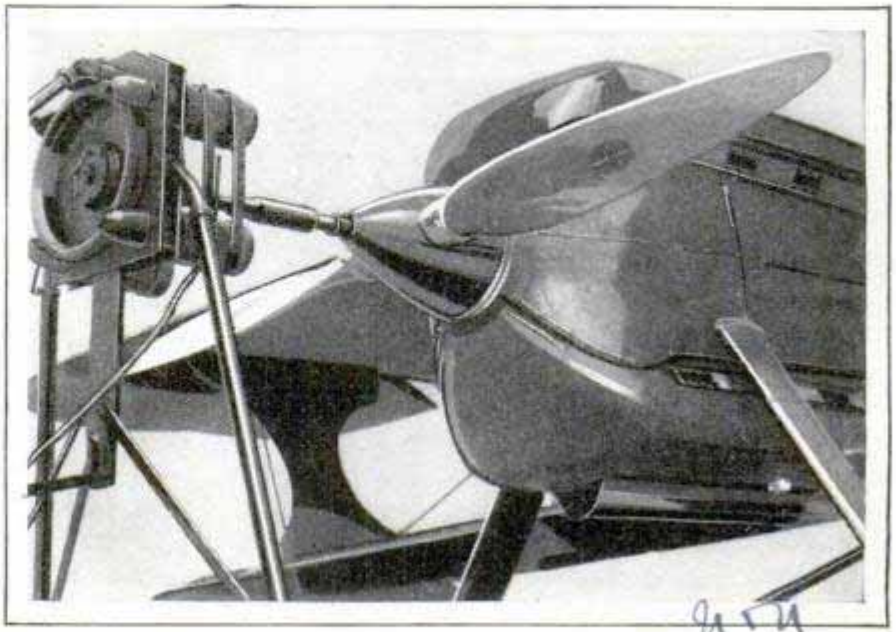
The principle of the block and tackle is adapted to a tree trimmer now on the market, with the result that time and labor are saved and the quality of work generally improved. Both hands are kept on the pole, making it easier to guide, and cutting is done with much less effort. The blade is pulled down by moving a sliding grip to which the tackle rope is attached. As soon as the limb is severed, a spring jerks the blade and the grip back to working position again. It is estimated that at least twenty per cent more power is afforded with this rig, as compared with the usual lever outfit. It is also lighter and quicker in action.

FANS FOR DRYING CORN IN CRIB LATEST AID TO FARMER

Powerful little ventilating fans have been adapted to the drying of seed corn, an outfit now developed being simple to install and considered practical for large raisers of the crop. Unit heaters are employed, and warm air blown through the corn, or the grain may be carried through a tunnel and the air blown around it. When heaters are not used, the drying can be accomplished by fans only. They are arranged to distribute air under the grain through pipes on the floor of the crib. Farmers are coming to realize more and more the importance of proper ventilation in barns where stock is kept. It has been demonstrated that a cow needs sixty cubic feet of air per minute to keep it in a healthy condition, a horse needs 4,200 cubic feet per hour and a hog, 1,500. Bees also require a regular air supply.

TWENTY-FOUR CYLINDER PLANE HAS RADIATORS IN WINGS

Special design was necessary in constructing one of the large airplanes for the Schneider cup races, particularly because of the cooling problem, and, for that reason, radiators were built in the wings to cool them and the motor as well. The engine had twenty-four cylinders and was made to develop a speed of more than 300 miles an hour.



View of the Radiator-Winged Plane at the Starter; Water in the Wings Helps Cool Radiators and the Motor

3798.

Chauncey McGovern Studying the Photo-Micrograph of a Human Hair, Which Helped to Prove That a Man Who Had Confessed a Double Murder Was Innocent, and Fixed the Crime on Another Person

TRUE STORIES of the MANHUNTERS

(The All-Seeing Eye)

By H. H. DUNN

A NEW and powerful force has joined the side of the law in the war on crime.

It has been established that the camera lens sees clearly that which the human eye, even when aided by the most modern of microscopes, fails to distinguish and that the photographic negative will record facts which the human mind does not grasp through any of the five senses. The result of this discovery is the camera detective, a man versed not only in the technicalities, but in the chemistry of photography to such an extent that he can make documents, handwriting, typewriting, fingerprints, even footprints, human hair, and other by-products of the so-called "perfect crimes," reveal not only what was done, but how the crime was committed.

Far different from the "handwriting expert," the "fingerprint reader" or any other previous form of scientific detective is this new mechanical sleuth. He never depends on his own eye, or even the eye of the latest development in microscopes, to establish a fact; he lets the lens of the camera, searching slowly and deeply among the evidence, carry to a specially prepared film the record which every criminal leaves somewhere in his activities. He uses no high-speed lenses, no complicated camera, no costly plate or film, no expensive paper. He can do his work, completely, competently and perfectly, in his own home with a $25 outfit, and he can present his evidence in such form that a jury will be convinced of its accuracy and truth.

A few months ago there arrived in San Francisco an aged clock repairer, who laid before the authorities a document he claimed to have found, with other papers, in a grandfather's clock he had bought in a small town in Georgia. As the district attorney read this paper, his mouth opened and his eyes bulged, for it purported to dispose of an estate valued at $330,000,000,

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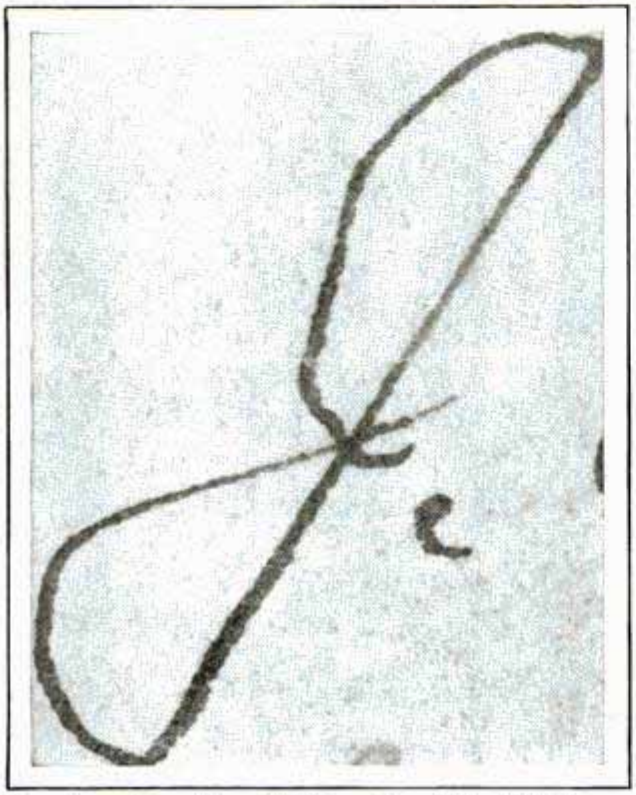
for which one will had been probated and the property distributed some time before. This alleged will was of later date; the signature, compared with that on the will



Proved to Have Been Written after Other Writing on the Same Sheet, This Photo-Micrograph Foiled a Fraud

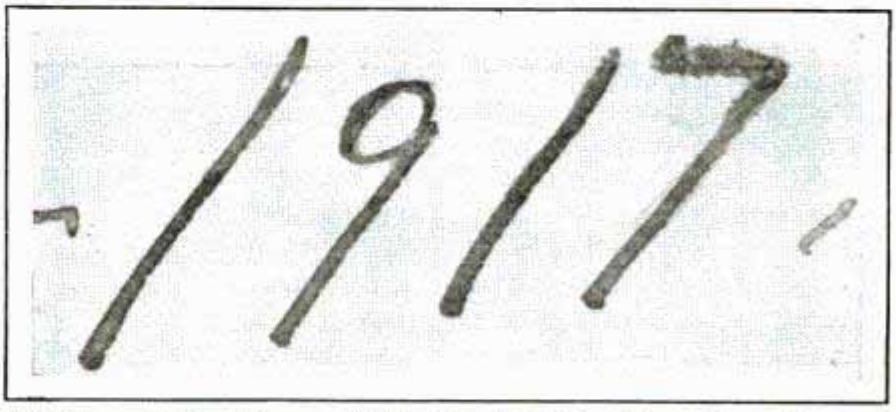
which had been officially recognized, seemed absolutely genuine.

But in San Francisco is the man who developed the camera as a detective, the man to whom city and county authorities turn when in doubt. He is responsible for decisions, made through the lens, on which more than half a billion dollars in litigation have been disposed of, both in and out of courts. His name is Chauncey McGovern, and it should be said that he looks less like the typical plain-clothes sleuth than it is possible to imagine.

McGovern put the newly found will in front of an ordinary camera, with a slow lens, and in the plateholder placed what is known as a process film, one which requires a long time for exposure, but brings out details invisible to the human eye or to the microscope, when an enlargement is made. First of all, the camera told the operator that the paper had been cut from a larger sheet, by revealing irregularities in the edge which the eye would not notice. Next the lens said that the paper was very old, of a peculiar kind, formerly used in legal documents in the southern states, but not manufactured today. The date of the paper was roughly fixed at fifty years ago.

Then, the enlargement, a huge square three or four feet in each dimension, revealed that the paper had been folded before the writing on it had been done. The creases were visible to the lens, as were also the minute overflow of ink from the letters, where the latter were written across one of the folds, so that the sizing, or surface, of the paper had been broken and the ink admitted to the fiber. At last came the most remarkable information of all. Beneath the present writing on the paper appeared, dim and gray, but imbedded in the very fiber of the old document, other letters, which had been erased with an acid, before the will had been written. These gray letters appeared everywhere except under the signature. In other words, the paper had been a letter, signed by the man who accumulated and left the vast estate. From it had been removed the original writing, and the new will substituted, leaving the genuine signature. Presentation of the facts to the proponents of the alleged will caused a speedy withdrawal of their claims.

An elderly man, carrying a rifle on his arm, surrendered to the sheriff of a California county, confessing that he "must have killed his two brothers." His story was that he lived with his brothers, all

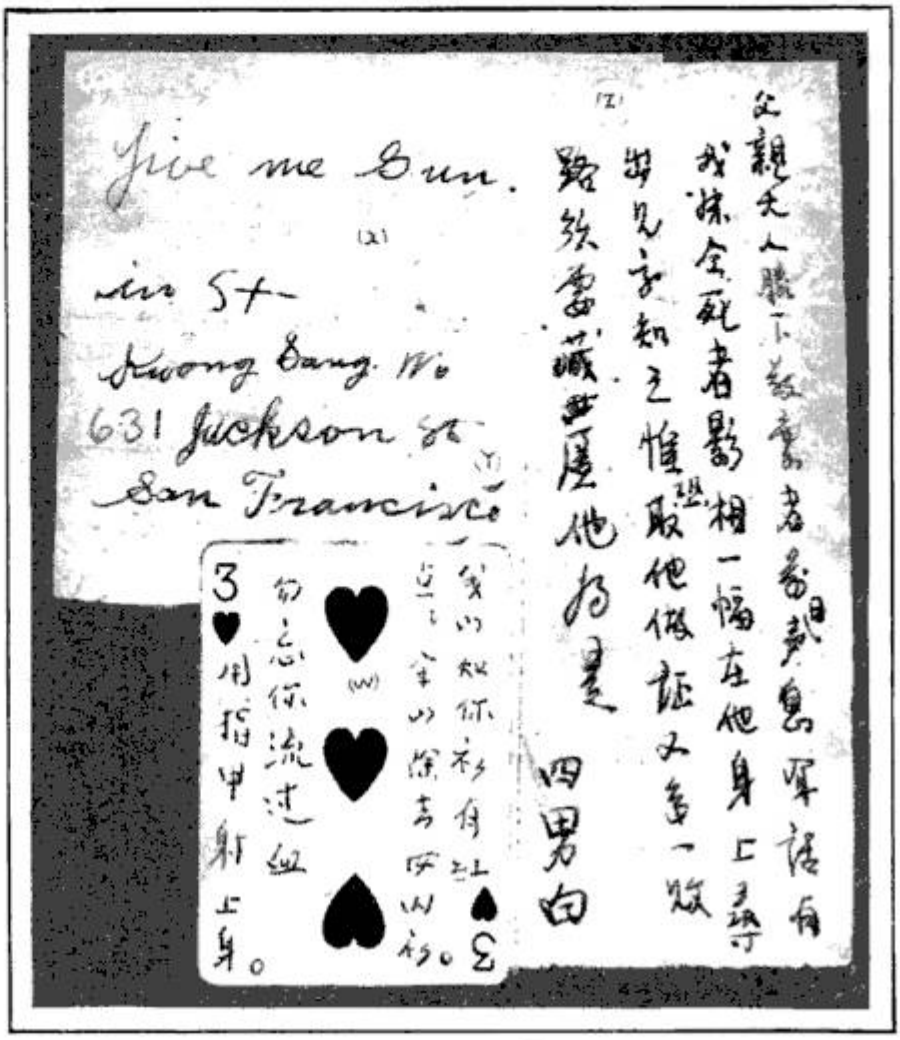


The Camera's Eye Discovered This Date Had Been Altered from 1919 and the Other Figures Redrawn over Smaller Digits

elderly men, in a house in the mountains; that a friend, who lived some five miles

away, had come in with a gallon of moonshine the night before; that they had drunk the moonshine, and that he had gone to bed intoxicated. In the morning, when he awoke, he found his own rifle, with one cartridge discharged, in his arm, and his two brothers shot to death in the next room.

The authorities rounded up the distant visitor as a witness. This man denied having been at the house, so McGovern took his little camera and his process films, and proved, by tracks in the earth, that a horse belonging to this fourth man had been at the three brothers' house recently. On a brush in the house he found black hair. All three of the brothers had white hair. The jail barber, where the fourth man was held merely as witness, cut the latter's hair. The camera compared the hairs, enlarging them until each was more than an inch in thickness on the print. Those found on the brush were proved identical with those from the head of the suspect.



The Camera Speaks All Languages; Here Is a Note, Written in Chinese on a Playing Card, with Samples of the Author's Writing in English

One of the bottles from which the four had been drinking was filled with black ink, covered with fingerprint powder and a photograph made. Fingerprints of the suspect were taken and photographed. But the prints on the bottle were in white on a black background; those of the suspect were in black on a white background. The camera solved the problem and made them comparable. Making a positive of the black prints, McGovern printed from it, and had both sets of fingerprints in white, proving them identical. Thus the camera removed from an aged man the terrible belief that he had murdered his own brothers.

A Chinese man, twenty-four years old, appeared from the Orient at San Francisco, demanding admittance as an American citizen. He was held at the immigration station. He claimed that he was born in Arizona, of a Chinese father and a Mexican mother; that, when he was four years old, he had been sent to his father's people in China, and that this was his first return to his native land. He presented a photograph of what purported to be himself as a child of four, and one of himself at present, made in China the day before his departure. He also had his passport of nineteen years before. The camera detective took these two photographs and enlarged them equally, until he had the two faces four feet square. Their identity was so obvious that the young man was admitted without the delay of an appeal to Washington.

The elimination of colors plays a prominent part in this new mechanical detective work. Faint ink marks are brought out hard and black; soiled paper made white, so that contrasts become brilliant, and creases, fingerprints, grease spots and

other ordinarily invisible identification signs are made plain.

There appears to be no end to the variety of work which the camera can do. A few months ago there appeared in a

The Firing Pin of Every Weapon Prints Its Own Individual Mark on the Cartridge for Future Identification

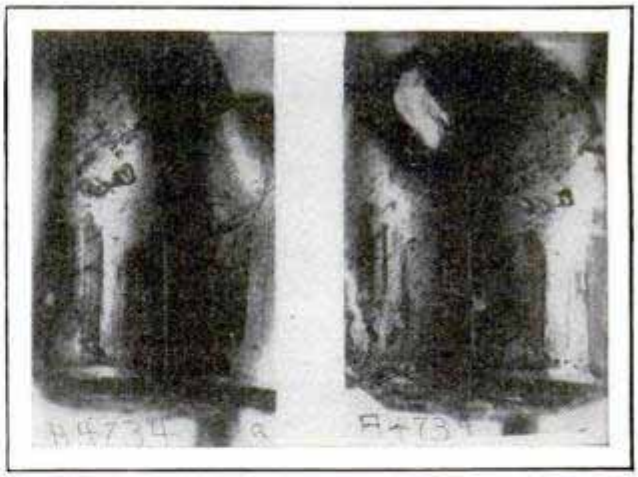
western city what might be called a "wave" of anonymous letters, all attacking the character of one woman, a bride of a short time. These letters were received, at the rate of one a month, by more than fifty women prominent in the society of the city. In each group of letters received by each woman, each letter was mailed from a different city, ranging from the Canadian border to the Gulf of Mexico and from the Atlantic to the Pacific. Each letter in each group was written in a different style of penmanship—some perpendicular, some backhand, some slanting, some with almost microscopic letters, some very large, some carelessly written, some with the greatest care. It was, in short, the most puzzling anonymous-letter-writing case which has appeared in American crime annals for many years.

After some six of these letters had been received by each of the more than fifty women, the object of their attacks and her husband appealed to the camera detective. One by one, the women who had received the letters came forward, until McGovern had some 500 of them in all the forms of writing adopted by the sender. Grouping these styles of penmanship, he reduced them to ten varieties. Then, going through the process described above, he made huge enlargements of one of each style.

These revealed, by peculiarities in the shadings, in the straight lines and in the forming of the most used vowels, such as "e," "i" and "o," that, while different pens had been used, the same hand had done all the writing. Photographic examination of the notes further showed that the same kind of paper had been employed for all, though the envelopes were different both in size and in quality. The object of the attacks suspected three women, social enemies. Samples of their writing were obtained, and the camera at once absolved them.

Then the young bride was asked to save carefully all the handwritten communications she received for one month. She did so, and among them were five notes regarding social affairs from a woman employed in the society department of a newspaper. These were written in one uniform style of penmanship, but the camera told that it was from the same hand that had penned the anonymous letters. Confronting this woman with the facts as bared by the negative brought a confession.

A marauder entering the office of a San Francisco manufacturer by night wore gloves, thinking to foil detection by leaving no fingerprints. He did, however, step in a dusty place on the floor, and then on the top of a desk to reach for certain records he wished to destroy. The camera saw that one footprint, compared it with the footprints made by shoes found



Bullets, Too, May Be Identified by the Camera and Traced to the Gun That Fired Them

in the home of a discharged employe of the factory, and the subject confessed.

"And it all can be done with a simple, cheap camera," says McGovern, "any camera, in fact, which has a ground glass in the back, on which accurate focusing may be done. The speed of the lens is immaterial, if time enough is given, a process

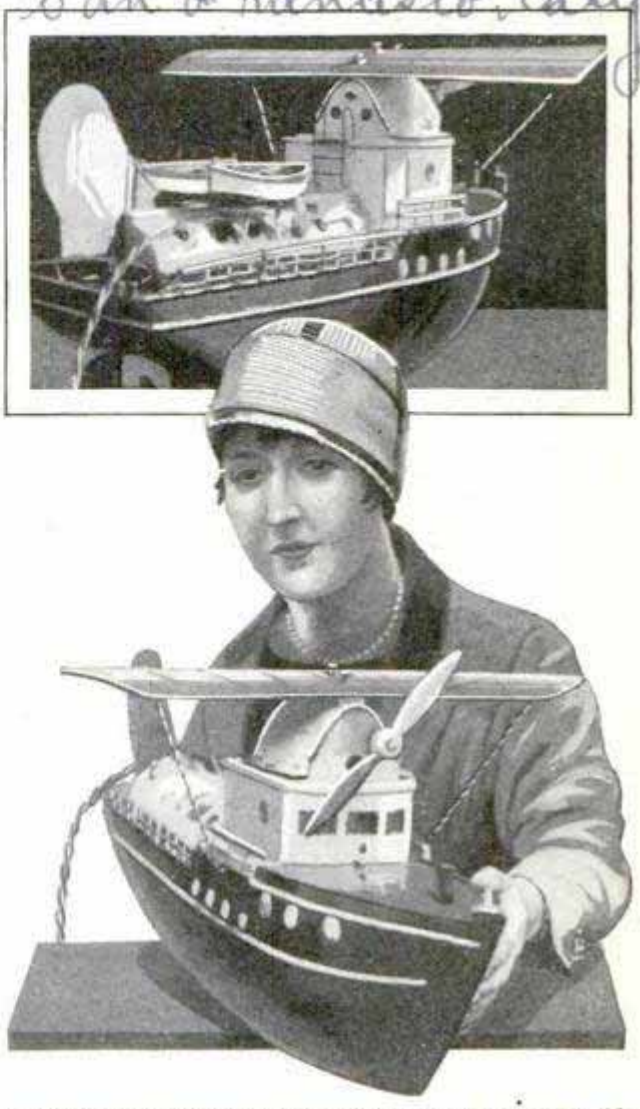
negative used, caustic-soda developer employed, and the fingerprint, hair, document, letter, footprint or photograph enlarged to the point at which the lens tells that which the eye and even the microscope cannot see. Today, with this inexorable mechanical investigator, no one can so disguise his handwriting—or even his typewriting—that the camera cannot tell the truth about it."

HOT SPRINGS HATCH CHICKENS IN SPECIAL INCUBATORS

Water flowing from hot springs near Thermopolis, Wyo., is to be led into specially constructed incubators for hatching chickens, it has been announced. The water remains at a temperature of from 135 to 150 degrees Fahrenheit the year around, and methods have been worked out for cooling it and keeping it at the proper heat for brooder purposes. It is also planned to use the water in hothouses for the cultivation of plants and vegetables. In one of the largest springs in this district, more than 18,000,000 gallons of hot water flow out every twenty-four hours.

SPEEDOMETER KEEPS A RECORD TO PREVENT DISPUTES

A motorcycle patrolman of Cleveland, Ohio, and an associate have devised a speedometer which promises to simplify the work of arresting violators of traffic laws and will also be a benefit to the drivers of cars, since it is adaptable both to motorcycles and to automobiles. Its distinguishing feature is that, besides registering the rate of a cycle while overtaking an auto and the speed of the car, these records are preserved for later consultation, so that all doubt and guesswork are eliminated. The instrument works automatically after a button is pressed, and the user need not watch it. For reference by a driver in case of an automobile accident, it would prove extremely valuable, as it would show just how fast the car had been going before the mishap took place.



Two Views of Model of Combination Craft with Double Propellers for Which High Speed Is Anticipated

BOAT AND AIRPLANE COMBINED TO MAKE HIGH SPEED

Principles of air and water navigation have been combined in a craft a western inventor has planned to develop high speed at a minimum expense. His boat is to be run by a screw propeller and also by an air propeller. In addition, it has a monoplane wing which may be folded back when the craft is docked. Steering will be done by the joint action of an air and water rudder. A speed of 100 miles an hour is expected without difficulty, the inventor believing that the wing and air propeller combined, with attendant decreasing of the weight upon the water, will give the desired effect. The water propeller is of a special cup-type that the maker of the craft has devised.

¶Last year, more than 1,000 automobiles crashed into trains.

Cmdr. Norman M. Steinmann, U.S.N.
Ash St., Winnetka, Ill.

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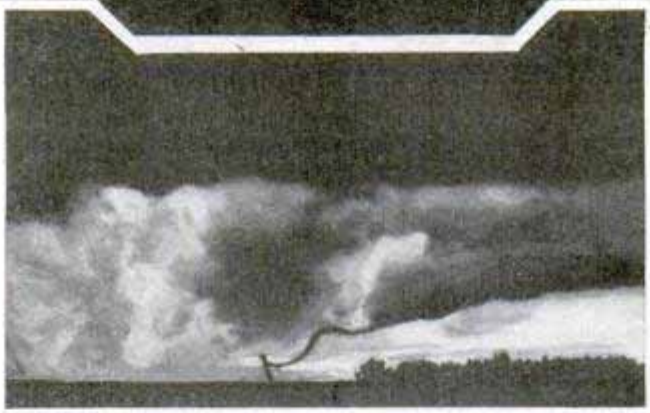
FREAKS OF TORNADOES AND HOW TO DODGE THEM

Dust Storm about Base of Tornado, Photographed at Three Miles

Unusual Tornado Funnel; It Appears Largest at the Base



Top Photo © N. Y. Times

Huge Tornado Cloud Above and Below; One of the Strangest Ever Photographed

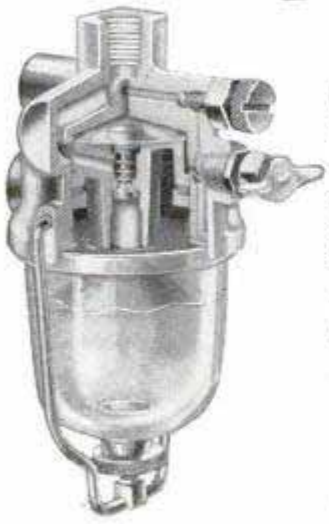
A tornado does not blow a building to pieces. It creates a partial vacuum so that the air confined in the structure bursts out, tearing the building into fragments. S. D. Flora, Kansas section chief for the United States weather bureau, is authority for this. But the suction force of a tornado is not as great as popularly believed. He says it has not sufficient power to lift up a person who is lying flat on the ground, although it may roll him about. Conditions in the great Mississippi valley region are particularly adapted for tornadoes. They form when a layer of cold air overlies a layer of warm air filled with moisture. They are most likely to occur in May and June. The action of the tornado is similar to the suction and whirling motion of water as it drains from a bathtub. Currents of air in the cloud do not move parallel to the ground, but either upward or downward. The destructive force is greater in the center. Tornadoes usually take place in the afternoon or early evening, following a warm, sticky morning, in which the lower air has been thoroughly heated. Few happen at night. That tornadoes do not cause more damage is because they cut such a narrow swath through the country. Rarely is a tornado more than two city blocks in width, generally much less. It is possible to outrun a tornado either with an automobile or train, as they ordinarily advance at from thirty to forty miles an hour, occasionally reaching a speed of sixty miles. A tornado develops as soon as the funnel can be seen hanging distinctly from the cloud, whether it reaches the ground or not. The funnels usually drop from low-hanging clouds. The greatest danger, Flora says, is not from the wind itself, but from the flying objects which the force of the storm whirls around with unbelievable velocity. If you ever find yourself in the path of a

tornado and want to flee, the best direction would be to the northwest, as the usual course is from southwest to northeast. But a better plan would be to lie down on the open ground, grab a root, or anything that is handy, to prevent being rolled by the wind, and trust to luck that no flying objects hit you. Flora says that, if you seek safety from a tornado in a basement, it is best to crouch down in the southwest corner, as debris is less likely to fall there.

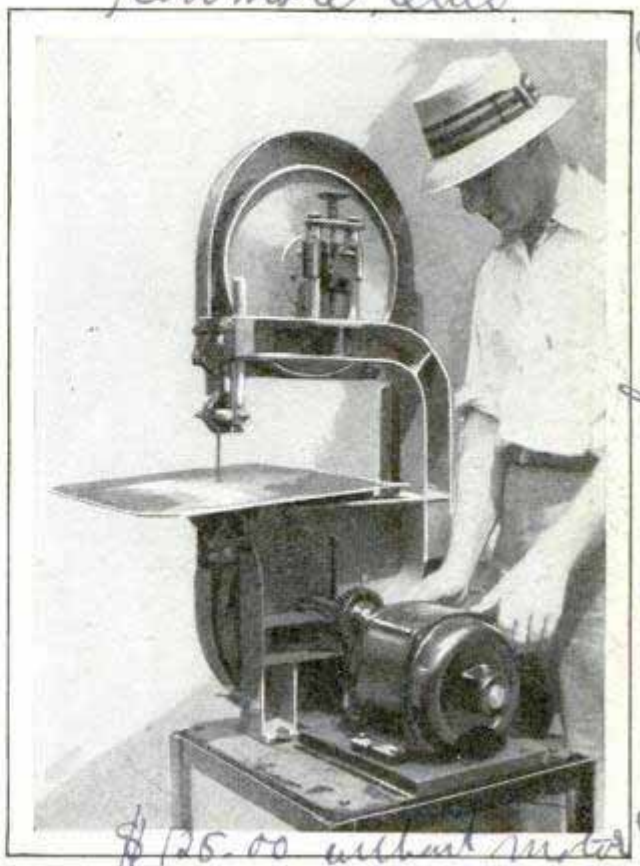
BEAM OF LIGHT AS "POLICEMAN" HELPS CURB SMOKE

By means of a vacuum tube and a beam of light, engineers are able to measure accurately the density of the smoke pouring from chimneys and so more easily detect violations of anti-smoke ordinances. A photo-electric cell is a basic unit in the outfit. A beam of light is directed upon it through the chimney. When smoke becomes sufficiently dense to hide the light, the cell is actuated to cause an electric relay to function and a recording meter registers in the engine room. Thus, the attendants can see that too much smoke is being made without going outside and steps can be taken to curb it.

AUTO PROTECTOR STOPS MOTOR WHEN OIL FAILS



Efficient protection against burned-out bearings, and other troubles resulting from attempting to run an automobile without lubricating oil, is afforded in an attachment which stops the car when the oil is exhausted. It is connected with the vacuum tank at the top and functions through a valve which shuts off the gasoline when the oil pressure fails. An emergency screw permits the driver to obtain gasoline sufficient for driving to the nearest service station, should the shut-off occur while he is on the highway.



Portable Bandsaw Outfit Ready for Use; It Weighs But 135 Pounds and Is Easily Moved About

PORTABLE ELECTRIC BANDSAW FOR HOME OR SHOP

For factory or home-workshop use, a portable bandsaw, operated with current from a lighting socket, weighs but 135 pounds and has a seven-foot blade that cuts either metal or wood. Work is supported by a tilting table, eighteen inches square, and the drive is so arranged that maximum speed can be attained in two seconds after turning the current on.

GOLF-BALL HOLDER ON OUTSIDE OF BAG SAVES OPENING FLAP

Golf balls are held in plain view, and can be removed without opening the bag or unfastening a flap, in a holder fitted into the wall of the bag. Springs keep the spheres in position and, when one is wanted, it is a simple and easy matter to push the retainers aside or lift them and pull out the ball.

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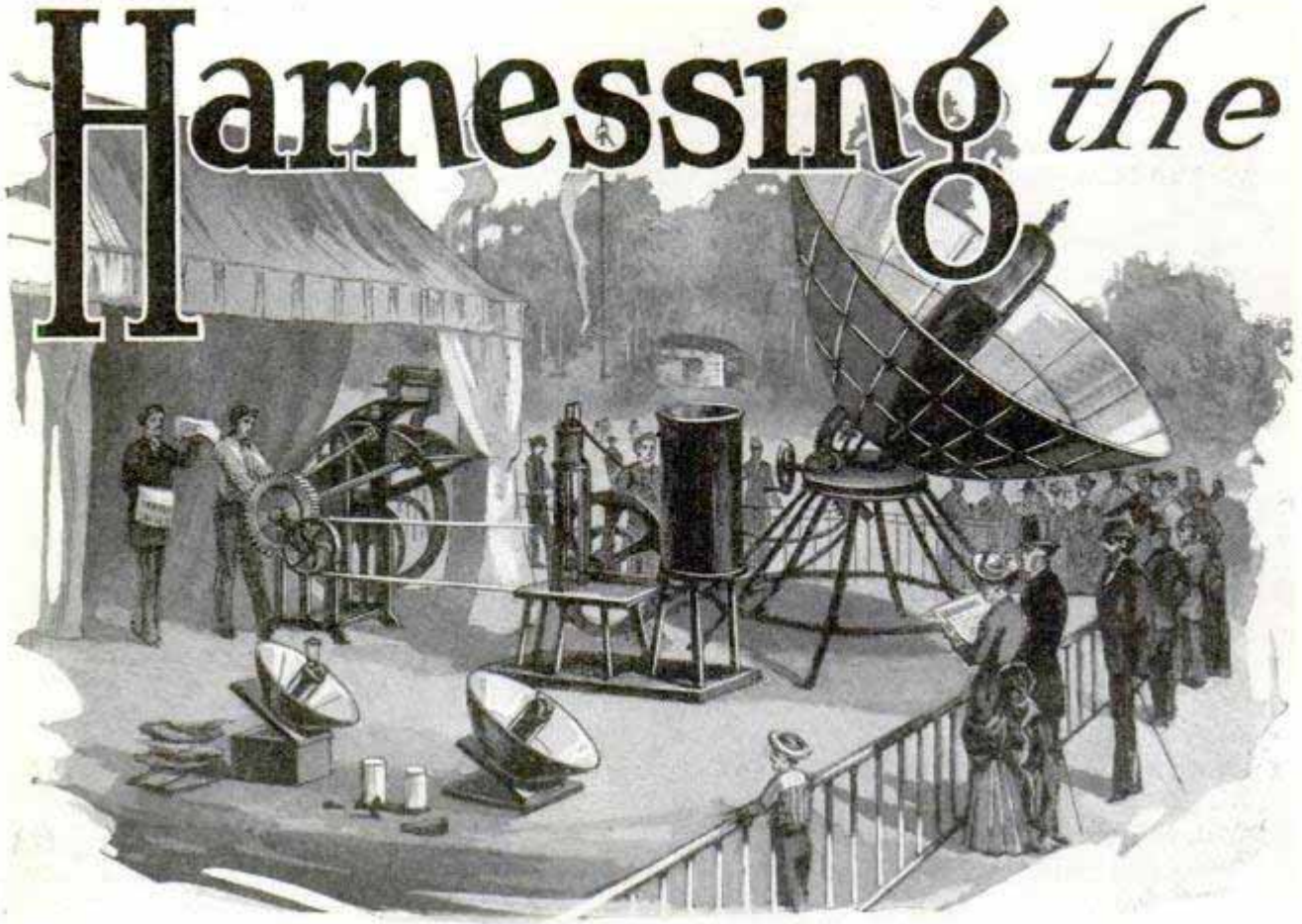
Harnessing the



Printing a Newspaper in Paris in 1878 on a Press Operated by a Solar Engine; the Group of Mirrors Focused the Sun's Heat on Water in a Copper Tube in Their Center

By RENE BACHE, 1923 Q St Washington, D.C.

THE classic experiment of frying a July egg on the sidewalk affords a beautiful illustration of the efficiency of the sun as a heater.

Discovery of means whereby the giant luminary could be put to work for mechanical and other utilitarian purposes would elevate civilization to a new and relatively exalted plane.

Such possibilities appeal strongly to the imagination. But why not drop speculation, just for the moment, and take a look at what has already been accomplished, in a practical way, toward a solution of the problem?

Large-scale mechanical plants, now operated in deserts of northern Africa, have proved economically efficient. In such regions, which have the advantage of cloudlessness and unfailing sunshine, there is exceptional opportunity for the employment of sun-driven machinery. Dr. C. G. Abbot, of the Smithsonian Institution, says: "In time, manufacturing will to a great extent follow the sun." The deserts may yet become great industrial areas.

Let us stick, however, to actual facts. In Tunisia and other French possessions of northern Africa, there is scarcity of water that is fit to drink, and solar distilling machines are in common use. Soldiers on the march are provided with portable apparatus of the kind, light enough to be carried on a man's back. It consists of a little boiler, a concave mirror, and a coil of tubing in a water jacket for a condenser. The sun's rays, concentrated by the mirror upon the boiler, will heat a quart of water and keep it boiling. One machine will supply four men, its output being two gallons per day.

In many parts of the world no safe drinking water is to be obtained, and resort must be had to distillation. At Salinas, in Chile, a large-scale contrivance for the purpose is a pentroof of glass with an area of 51,200 square feet, erected over a large, shallow water tank. The water, evaporated by the sun, is condensed on the relatively cool glass, trickles down its slopes, and drips from the lower edges into gutters which carry it to receptacles

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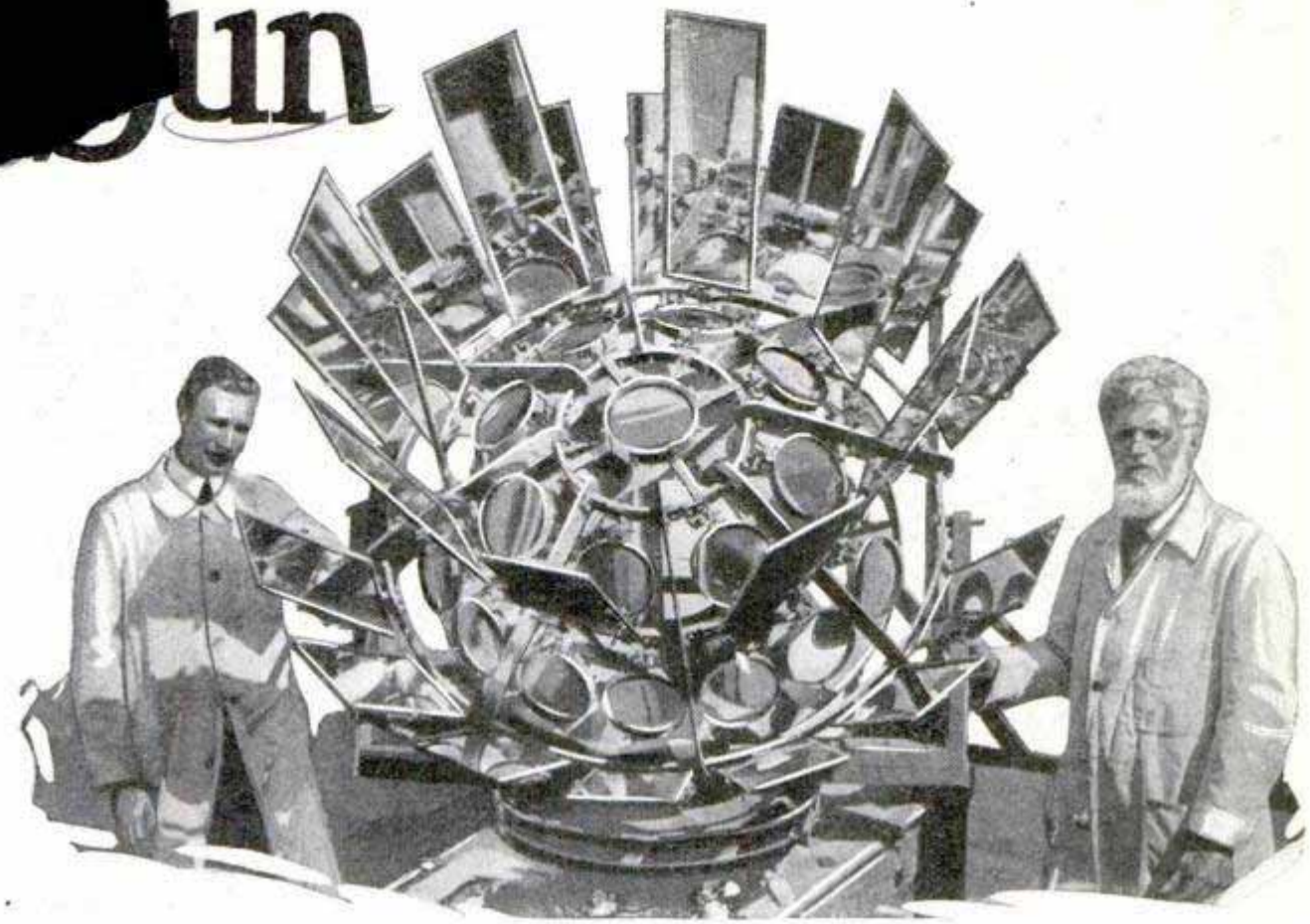


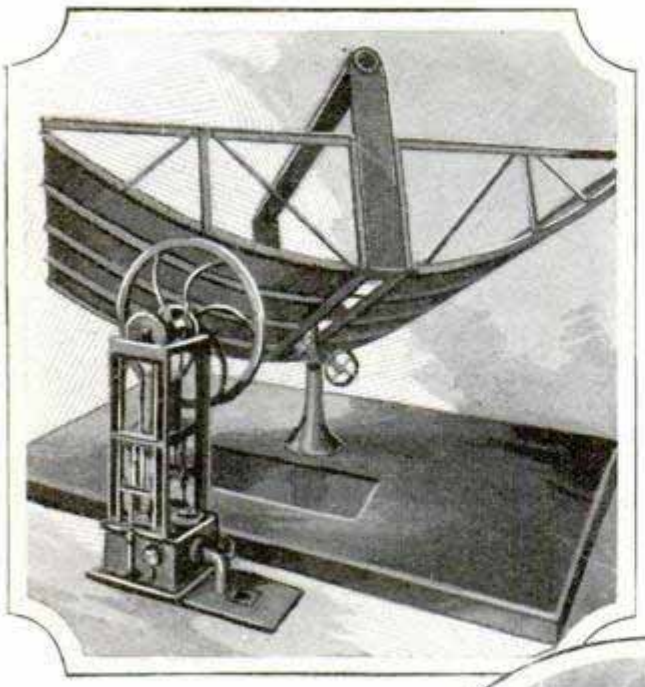
The Moreau Sun Furnace, One of the Many Mirror Devices Designed to Collect the Heat of the Sun from a Fairly Large Area and Focus It in One Spot to Do Useful Work

suitably placed. The apparatus yields 5,000 gallons of distilled water a day, or four-fifths of a pint for every square foot of glass. Allowing for interest on the money invested, the water costs less than a cent a gallon, the chief item of expense being breakage of glass by whirlwinds.

The present generation may expect to see sunshine cookers in common use by housewives. It is no mere imaginative idea, inasmuch as cookers have already proved their practical value. They are extensively utilized in Egypt, in the African Karoo, and in the Punjab of India, for baking and other culinary purposes; teakwood boxes, insulated, blackened inside, and fitted with double-glass tops. These sun ovens, which have the advantage of eliminating cost of fuel, afford temperatures of from 240 to 275 degrees Fahrenheit.

The first solar cooker was invented, in 1870, by an Englishman named Adams, a civil official at Bombay. It had the shape of an inverted eight-sided pyramid, hollow, lined with mirrors, and containing a cylindrical copper vessel. The sun's rays, reflected by the mirrors, were concentrated upon the copper vessel, which had a glass cover to retain the heat. The contrivance served admirably for roasting and stewing, and prepared a ration for seven men in two hours. If the steam was retained, the result was a boil or stew; if allowed to escape, it was a bake.

Not long ago, Dr. Abbot, who makes the study of the sun his special business, devised a solar cooker that operates on an entirely new principle. It bakes a loaf of bread or roasts a piece of meat as well as any gas range. A half cylinder of iron, lined with mirror glass, catches the sun's rays and concentrates them upon a metal tube which is the half cylinder's axis. The tube contains oil, which, expanded and made lighter by the heat, ascends through the tube. The latter is continued to form a loop outside the half cylinder, making it an endless arrangement. Descending through the loop, the oil cools. But the sun's heat, forcing the oil up through the part of the tube inside the half cylinder, compels cooled oil to follow it, else there would be a vacuum. Thus, while the sun



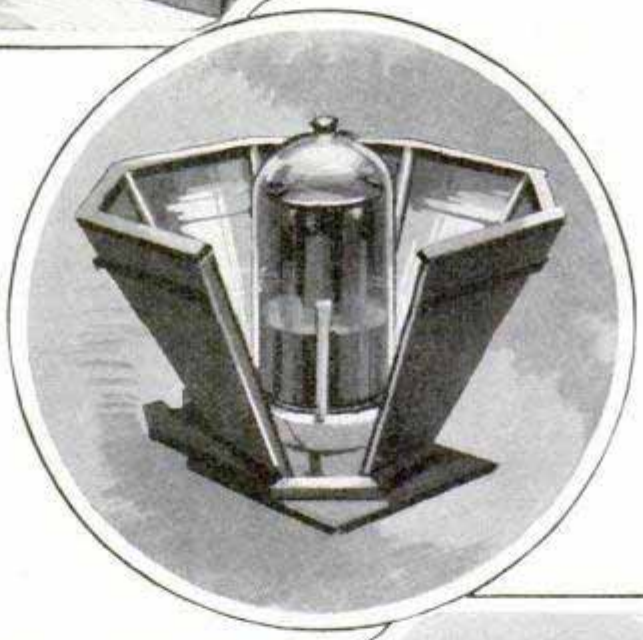
shines, there is a continuous circulation of oil up and around. The loop passes through a box that contains an oven. Heat from the oil, as it runs through, warms the oven and does the cooking. With this apparatus Dr. Abbot cooked meals on the summit of Mount Whitney, amid everlasting snows. He found that it cooked much faster at that lofty elevation, because the sun's rays, having a less thickness of atmosphere through which to penetrate, were much hotter.

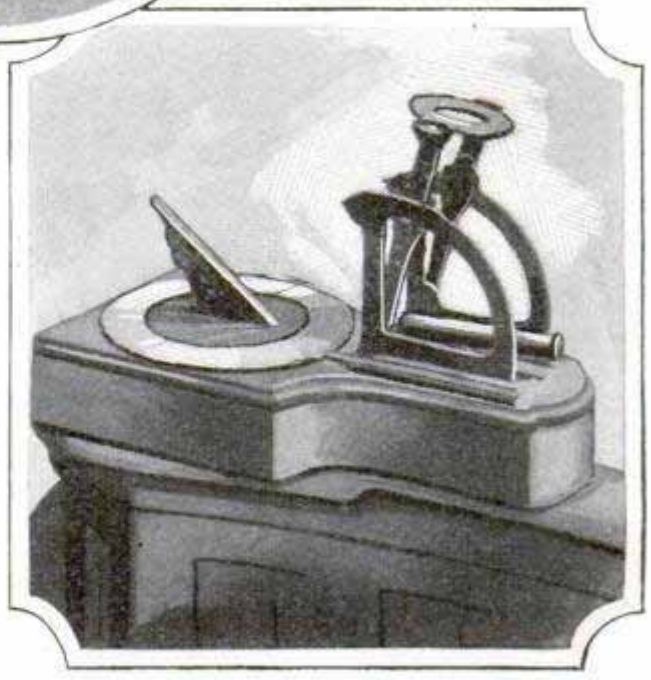
In southern California, where the sun shines practically every day in the year, many thousands of private dwellings are supplied with hot water for all domestic uses from roof tanks wherein it is raised nearly to boiling temperature by the solar rays. Such a tank, fixed on a sloping roof with suitable exposure, is kept filled by a pump operated by a small engine or by a windmill. It is insulated, bottomed with sheet copper, painted black, covered with double glass, and contains a coil of black-painted pipe which connects with the piping system of the house.

The inmates of a dwelling thus equipped draw hot water from the tan[illegible] wanted, for bathing, washing [illegible] purposes, just as they would fr[illegible] nary household boiler. Ther[illegible] plenty of it, and, when days happe[illegible] cloudy, it will stay hot for thirty-six hou[illegible] In view of the efficiency of the apparatus, it seems extraordinary that water-heating tanks of the kind are almost unknown outside of southern California.

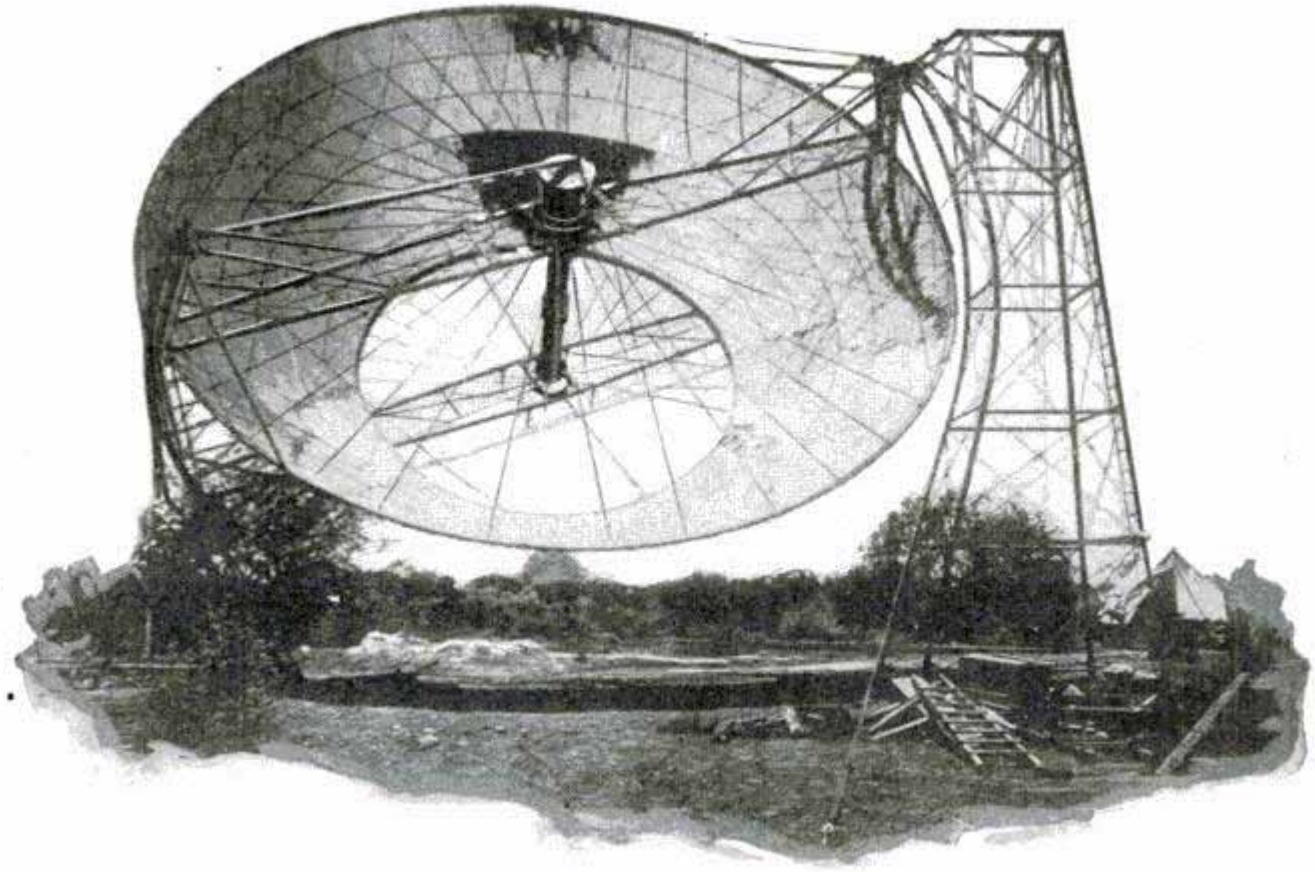
There is a recently patented invention which employs this device with improvements. Distributing hot water to the kitchen, the laundry, the bathroom and other parts of the house, it has pipe connection with a gas water heater in the basement, which, when the sun fails to shine, can take up the job.

In Death Valley, an important industry is the mining of magnesium salts, which lie in beds like clean white snowdrifts along the flanks of the mountains. Powerful streams of water are used to wash the stuff into sluices, from which it passes into settling tanks.





Two Sun Furnaces and, Below, a Sundial and Noon Gun, the Latter Being Fired by Rays Focused on the Touch Hole by a Lens



An Enormous Mirror Reflector Set Up at Pasadena to Pump Water for Irrigation; Practical Sun Furnaces Are Being Used in Many California Homes to Heat Water for Household Use

To purify the salts, they are dissolved in water raised to high temperature by great solar heaters, copper coils under sheets of glass set at an angle for maximum exposure to the sun's rays.

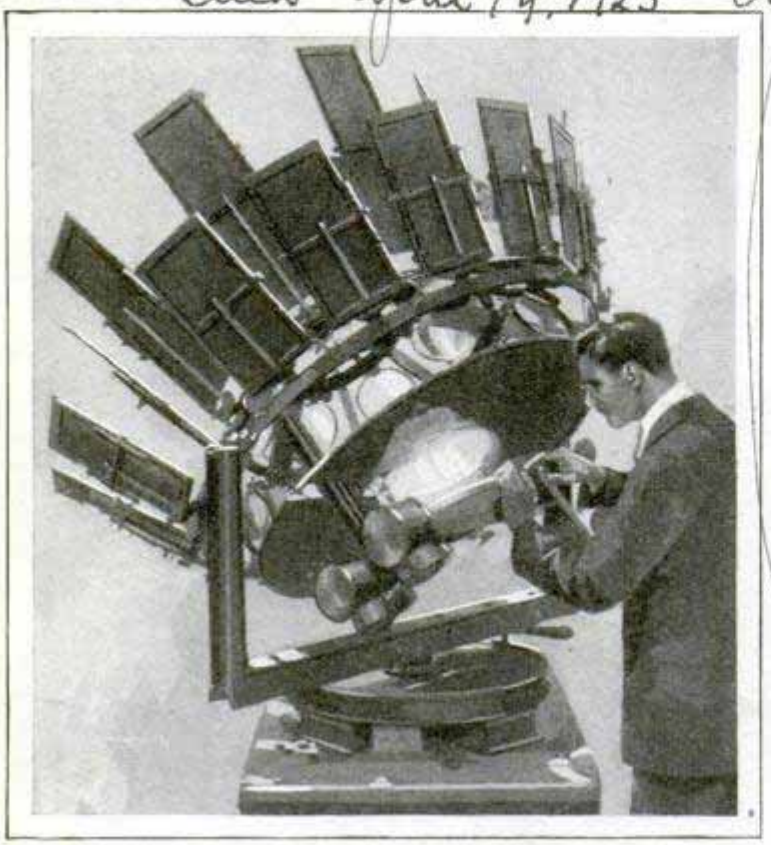
John Ericsson, the famous engineer and inventor, built a number of "sun motors," as he called them. His last achievement in this line, which he exhibited in 1883, employed the principle now so successfully illustrated by the large-scale Shuman-Boys solar plants operated in the Nile valley, to pump water for irrigation. It was a trough with a curved bottom lined with mirror glass, which reflected the sun's rays toward and upon a cylindrical boiler placed lengthwise of the trough. By this means steam was generated which ran a small engine. It was never put to any practical use. But five years earlier, in 1878, at the Paris exposition, a Frenchman named Pifre used a solar engine of his own invention to run a printing press, issuing therefrom a little daily newspaper which he called the Sun Journal. It worked admirably. A mirror-lined reflector in the shape of a hollow cone, eleven feet four inches in diameter, concentrated the sun's rays upon a boiler which had a capacity of eleven gallons. It was the first successful solar engine.

Pifre's idea was copied on a magnified scale in the construction of a huge apparatus set up at Pasadena, Calif., in 1900. The wheellike mirror-reflector, in the shape of a flat cone, had a diameter of thirty-three and a half feet, and, turning to face the sun, concentrated the rays upon a boiler which held 100 gallons. The machine was designed to pump water for irrigation. It developed four horsepower and lifted 1,400 gallons per minute. As an experiment it was very interesting, but the cost of operation was too high to make its use economically feasible.

The Shuman-Boys apparatus has proved so successful that several outfits of the kind are now operated in the Nile valley, and others have been installed for irrigating purposes by the French government in Tunisia.

Such an outfit occupies several acres of ground. Trough-shaped reflectors, 220 feet in length, concentrate the sun's rays upon tubular boilers which run through the troughs. The latter, resting upon steel cradles supported by a framework of cast iron, are heeled over toward the east in

Article 6st May. 1924 Marcel Eloi Moreau
b/32
Click April 14, 1925 Redwood City. Calif



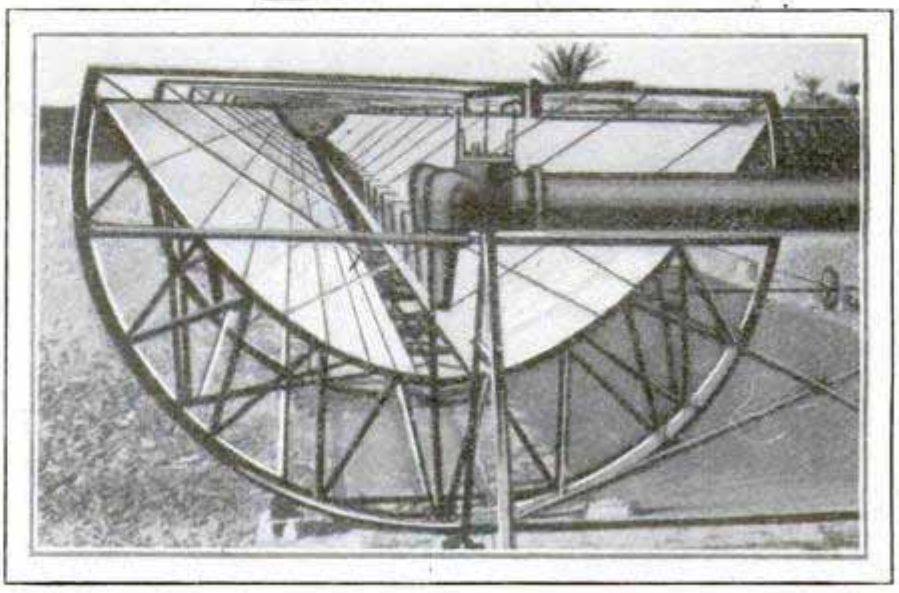
Rear View of the Moreau Sun Furnace, Showing the Heat Tubes on Which the Sun's Rays Are Focused

the morning and toward the west in the evening. Steam generated for operating machinery represents sixty-odd horsepower for each acre occupied by the plant.

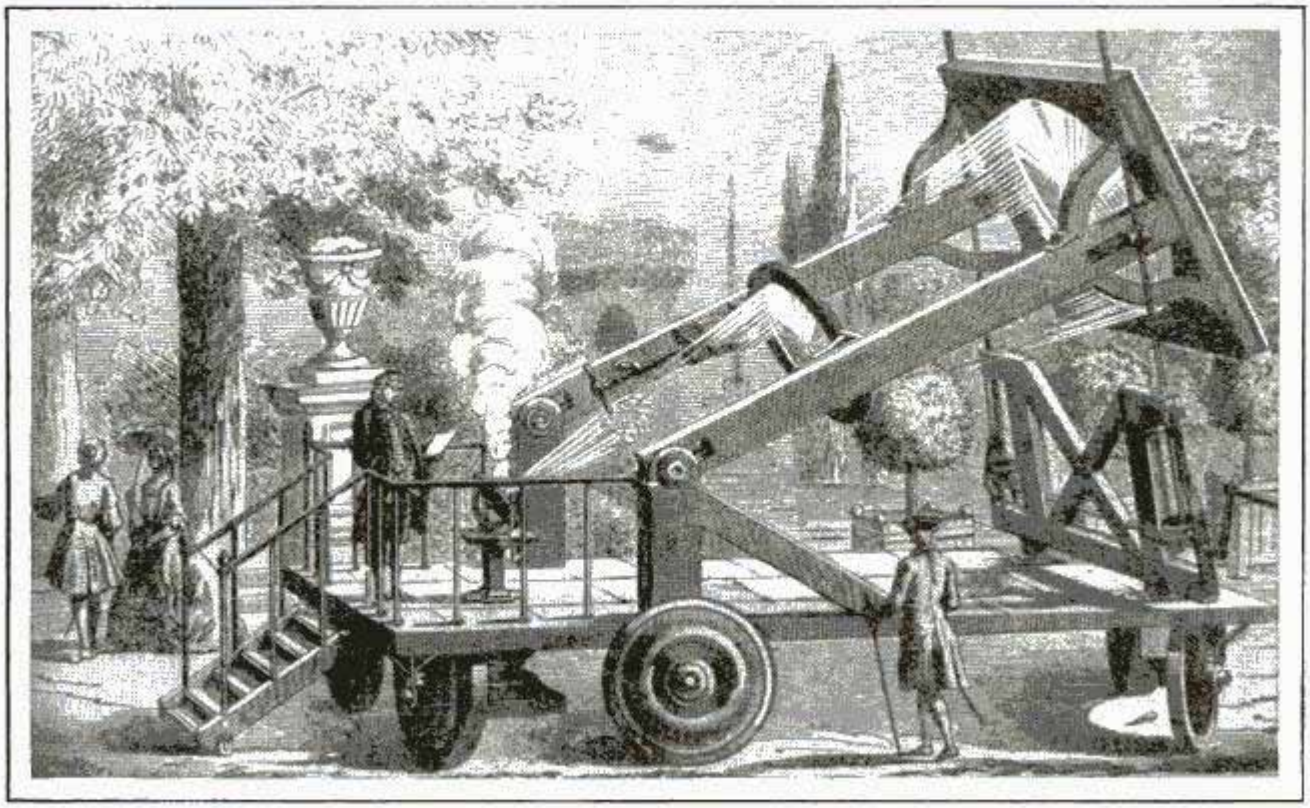
The economic practicability of sun power in desert regions is thus satisfactorily proved. Can it be doubted that from this beginning will eventually come developments most important to the world's progress? Scientists in every civilized country are busy with the problem, which has engaged attention at least as long ago as the thirteenth century, when the monkish philosopher Roger Bacon put his brain to work on it.

Near the end of the eighteenth century, a French physicist, named Bernieres, built a really remarkable contrivance which employed two enormous lenses, one of them seven feet in diameter, and the other with a diameter half as great. The larger lens concentrated the sun's rays upon the smaller one, by which they were brought to a focus. The duplex arrangement, of great weight, was mounted on a wheeled platform, the lenses being held in frames sustained by a pair of pivoted arms which, by turning a crank, could be lifted or lowered to correspond to the angle of the sun. The wheels at the corners of the platform were turnable in any direction, so that the affair, on a sunshiny day, could be made to face the solar luminary, the focused rays generating a temperature high enough, it was said, to "make iron run like water."

Such heat, however, is of small account compared with that claimed to be produced by the recently invented machine of Marcel Moreau, a San Franciscan. He calls it a "sun furnace," and declares that it will melt or vaporize any substance known in nature, not excepting the diamond. Twenty-two mirrors are arranged about a common center in such wise as to receive and reflect toward that center a great quantity of sunshine. The rays reflected by the mirrors are directed upon twenty-three lenses set in a movable hemispherical frame which is pivoted on a rotating base. All the rays that pass through the lenses are concentrated at a single focus, wherein a chunk of platinum or a piece of brick is quickly consumed. Producing temperatures up to 15,000 de-



One of the Trough-Shaped Reflectors of a Shuman-Boys Solar Heating Plant near Cairo, Egypt



Giant "Burning Glass" Constructed by Bernieres, a French Physicist, in the Latter Part of the Eighteenth Century to Demonstrate How Power Could Be Obtained from the Sun

grees, it is a useful apparatus, if only for scientific purposes, says the inventor.

The possibilities of solar electrical developments have yet to be explored. Solar energy may be converted into electrical power. A Frenchman, Jules Guillot, residing at Vichy, has constructed an arrangement of mirrors, nine feet square, by means of which he is able to gather enough energy to produce electricity for lighting and heating his flat. The sun, while it shines, loads storage batteries with a surplus for use at night.

A vivid notion of the heat carried by a sunbeam is obtained by experiment with a lens, which, though but an inch in diameter, will concentrate enough rays to set wood aflame in a very brief time. Dr. Abbot estimates that midsummer sunshine falling upon twenty square feet of surface represents an amount of energy equal to one horsepower and that an acre is equivalent to 2,200 horsepower.

COLORS HELP SOLVE PROBLEMS THAT BAFFLE ENGINEERS

Engineering problems that have perplexed skilled mathematicians are solved with comparative ease, it is reported, on an electrical apparatus that makes interesting use of color. A celluloid model of a steel part to be studied is adjusted in the machine and stress applied at different parts. The shadow of the unit, when passed through a series of lenses upon a screen, appears in shades of gray, but the application of strain causes the color to change to green and other tones. Where the stress is the greatest, the hue will be the darkest in the shadow. By these tests the examiners are able to determine where the heaviest loads will fall on the real units, so that they can be built accordingly.

TRAY CLAMPED ON CARD TABLE SAVES SPACE AND TROUBLE

Placing cigar trays or glasses on top of the card table usually interferes with the game and is likely to damage the surface. This difficulty has been eliminated in a convenient holder that is clamped to the table edge. It is made in a variety of finishes and, being out of the way, there is little risk of spilling ashes or liquids.

Setting One of the Guns for Target Practice on Old Bridge Which Was Destroyed in North Carolina

CONCRETE BRIDGE AS TARGET TESTS GUNNERS' SKILL

"War" was declared on a 1,000-foot concrete bridge in North Carolina recently for the double purpose of giving army marksmen target practice and to remove the structure to make way for a dam across the Peedee river. Bombing planes and artillery did the wrecking, some of the guns from a distance of two miles.

STEAM AND GAS COMBINED TO DRIVE LOCOMOTIVE

Principles of the steam and internal-combustion engine have been combined in a locomotive built in England. The steam is used for starting, for overloads and for auxiliaries such as brakes and train heating, while the internal combustion is used for continuous working. There are eight cylinders, four on the outside and four between the frames. The principle of operation is to admit steam from the boiler to one side of the pistons, then take up the drive with power from the gas combustion. This gives a double-acting engine with steam at one end of the cylinder and gas explosion at the other.

"ELECTRIC SUN" IN CEILING REDUCES HEATING COST

By means of electric heat reflectors placed in the lower part of the ceiling, a Danish engineer has developed an efficient method for heating auditoriums and other large rooms with high walls. The chief features of the system are said to be economy and greater healthfulness, as the heat is communicated more directly to persons inside instead of heating the air and reducing its humidity. As soon as the current is turned on, occupants are said to feel an agreeable warmth like that of sunbeams on a fresh spring day without the sense of suffocation which sometimes attends the heating of a room by steam or hot air.

PORTABLE ROTOR STREET BRUSH SAVES TIME AND TROUBLE

Fashioned after the design of the larger motorized units, a portable street-cleaning brush, introduced in Germany, sweeps dirt into a holder as it is pushed along, saving labor and greatly increasing the operator's efficiency. With it, one man can

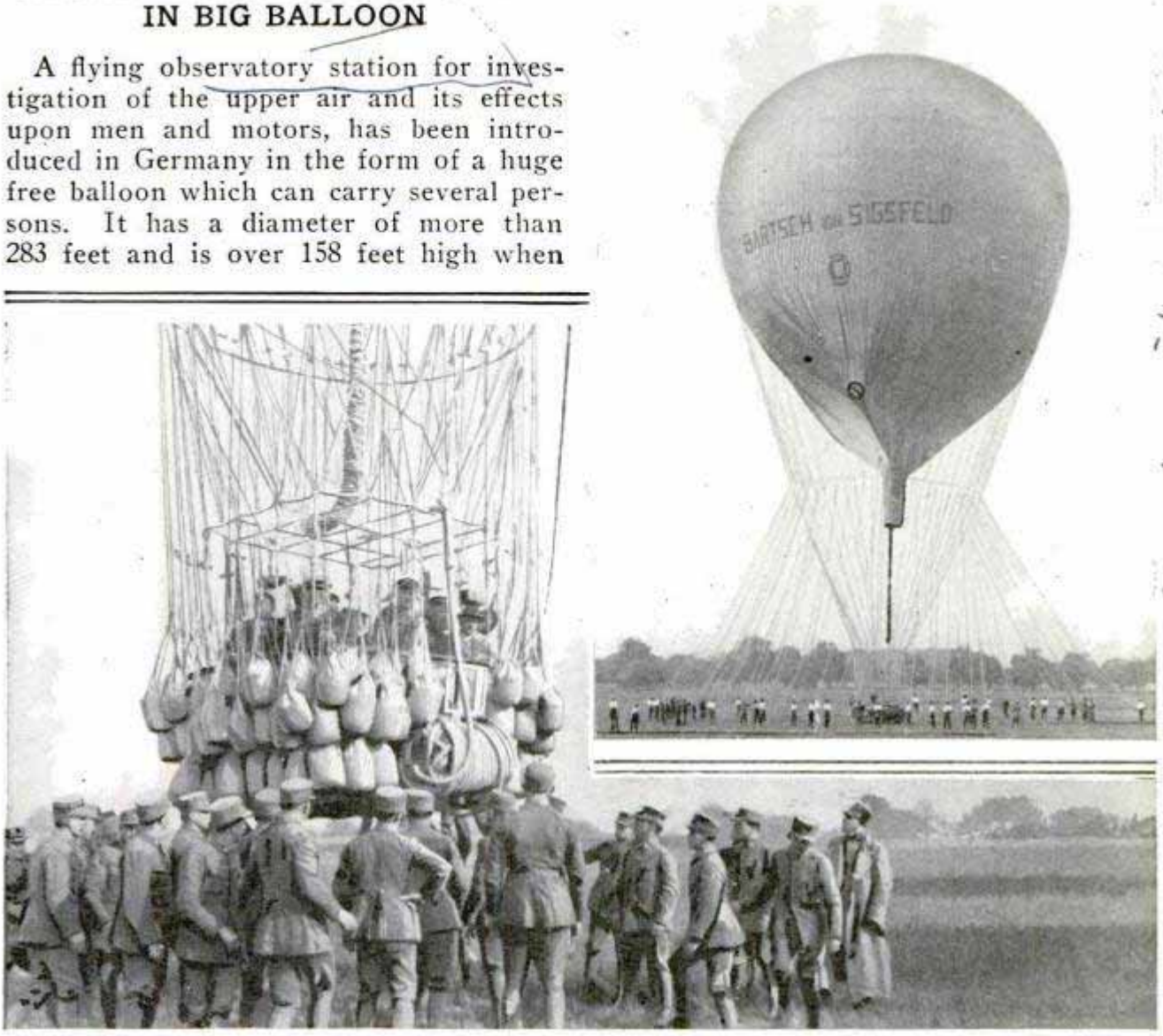
Operated like a Carpet Sweeper But Does a Thorough Job on the Streets; Dirt Is Swept into the Holder Just Back of the Wheels and Is Easily Emptied

© Henry Miller

clean two or three times as much space as with a broom, the manufacturers claim.

PROBE MYSTERY OF UPPER AIR IN BIG BALLOON

A flying observatory station for investigation of the upper air and its effects upon men and motors, has been introduced in Germany in the form of a huge free balloon which can carry several persons. It has a diameter of more than 283 feet and is over 158 feet high when

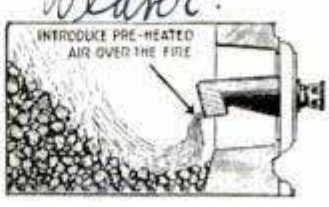


Close View of the Huge Basket of the Balloon and a Distant Perspective of the Entire Bag; This Enormous Air Observatory Station Is Over 158 Feet High

but a fifty-per-cent charge of gas has been admitted. It is adapted to use with hydrogen and an ingenious method has been worked out for reducing the likelihood of fires from leaks of the hydrogen or other causes when engines are being tested in the balloon. The gas enters a sort of chimney shaft and escapes from the top of the balloon so that it is as far away as possible from the basket. The big bag is to be used in tests on the air pressure at high altitudes, moisture, temperature and radiation conditions, while a ten-horsepower engine is run to observe how it performs high in the air. On a trial trip, it carried seven persons.

CARBURETOR FOR FURNACE FIRE HELPS SAVE COAL

Saving of coal and a marked reduction of soot are claimed for a carburetor unit for hot-air, steam or hot-water furnaces. Its essential function is to provide a supply of preheated air over the fire so that



there will be more complete combustion of the gases that ordinarily pass out to form smoke and soot. The carburetor is not difficult to install and also reduces ashes and clinkers.

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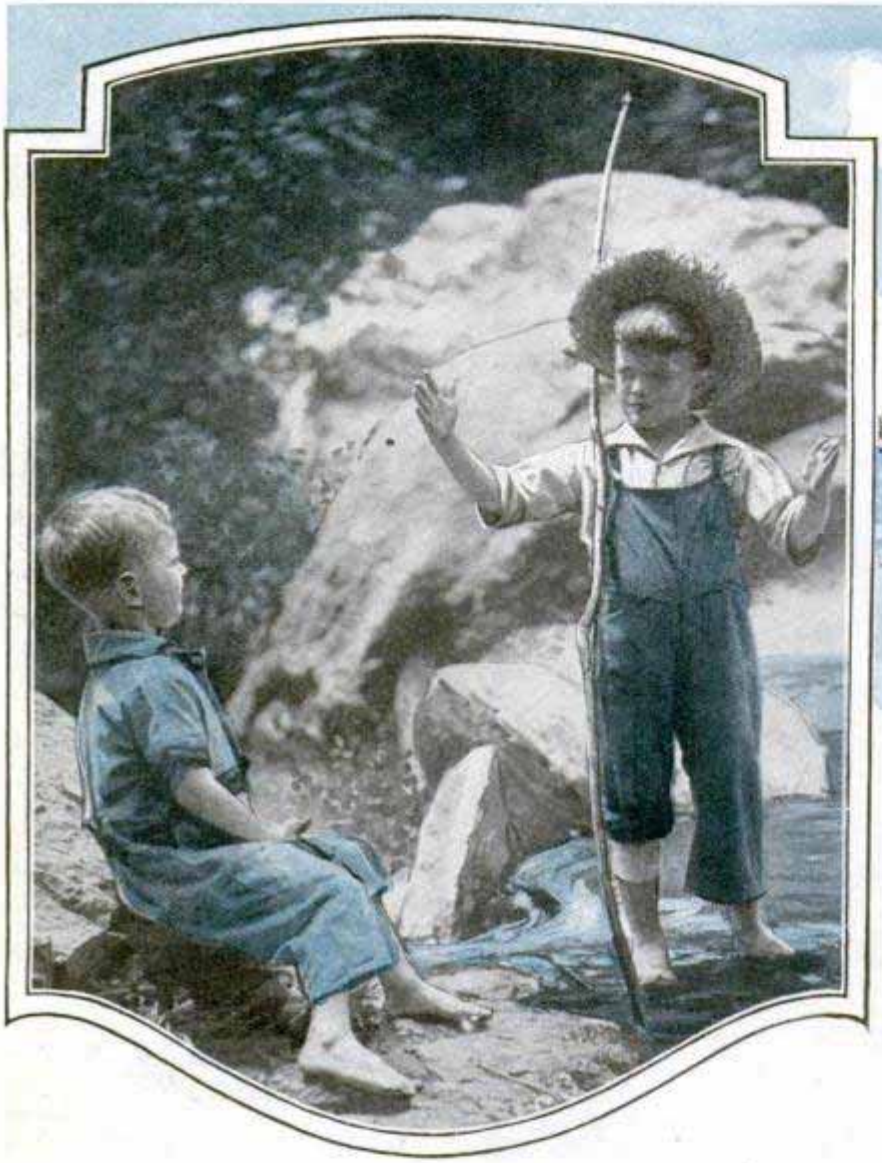
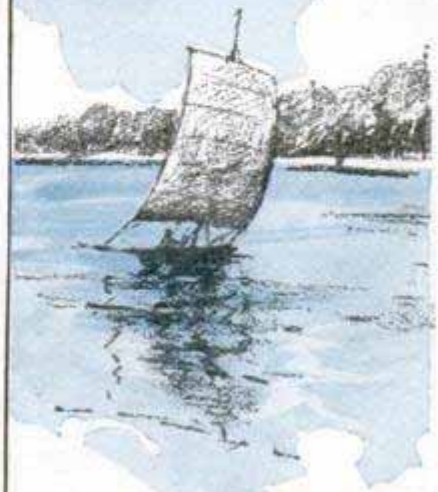
How





By CHARLES PHELPS CUSHING

138 W. 65th St. New York.

WHAT are the prime necessities when you go fishing? Many will name a fishpole and a line, a sinker and a hook, and a can of bait. Some would be tempted to add, perhaps, a "jug beside you in the wilderness," a bird in the tree tops singing or an umbrella for protection from the glaring sun. For as you get older you crave more comforts than in the days when you were a barefoot kid in overalls and hickory shirt, with a frazzle-brimmed farmer-boy straw hat—the good old days when the biggest ones always got away.

But the typical American method is only one way, though a good one, to go fishing. There are as many other methods prevalent in this curious wide world of ours as there are "ways to skin a cat." An Indian up in British Columbia would discard bait and hook and line and save only the fishpole to make a gaff of it. An Eskimo might, just as likely, throw away everything but the line, and make a noose of that to snare or lasso his prey through a hole in the ice.

A youngster living alongside the Mississippi, where catfish are the chief catch, might take the jug, empty it, then cork it tightly and cast it adrift on the current with a hook and line tied to its handle; then follow its drifting in a skiff—the method of fishing which he calls "juggin' fer cats."

A Japanese or a Chinaman, just as likely, wouldn't dream of having his bird singing to him from a tree. The Oriental makes his bird—a cormorant—do the fishing for him. Around the bird's neck he places a ring. When the unhappy fowl darts after a fish, snatches it in his bill and tries to swallow it, he finds that he can't—the ring around his neck won't let him. The fisherman then makes him disgorge the catch.

Even the umbrella isn't everywhere put to the same use as you and I might put it. In England and France a popular method is to hang an open umbrella from the fishpole; the shadow it casts upon the water is helpful to attract the fish to where the bait is suspended, right beneath.

Indeed, there are so many different ways

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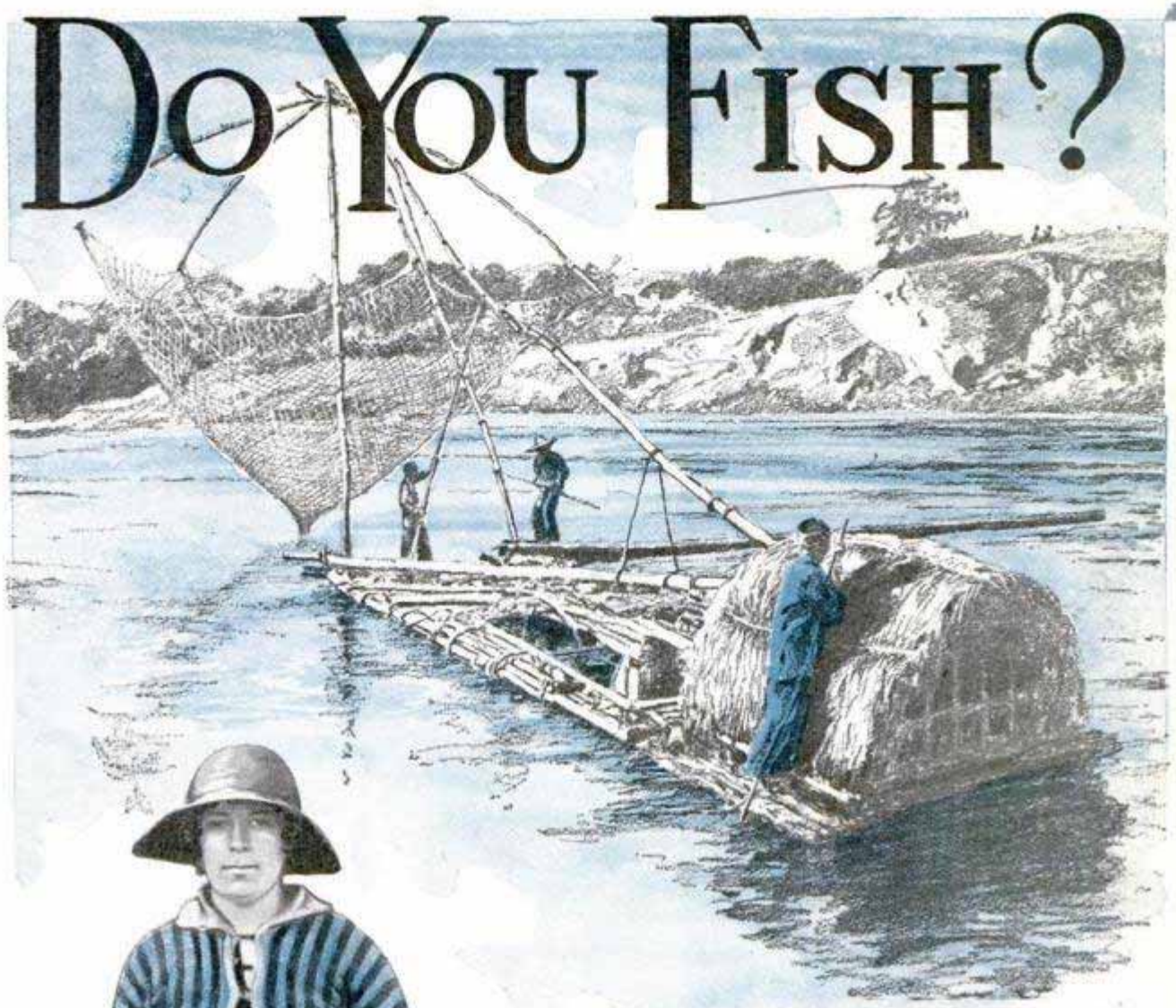
DO YOU FISH?

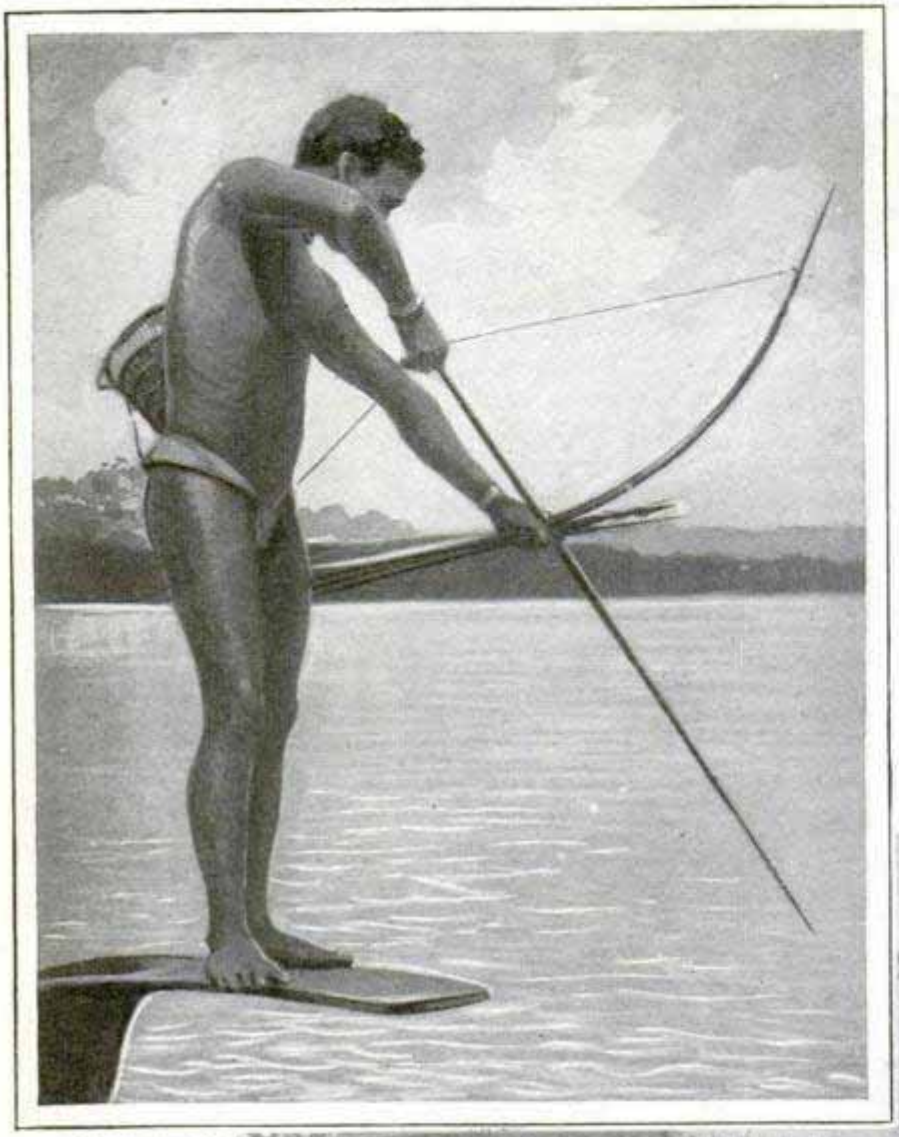


Fishermen of Indo-China Use a Dip Net on a Bamboo Barge, While the Oyster Women of France, Left, Fish with a Rake

© N. Y. Times

to go fishing that we have room here to mention only a small number of them. The whaler, with a miniature cannon, shoots a harpoon into the side of his prey and then reels it in with a power windlass. After that, in lieu of "stringing him," he blows the great fish up with air, like a motor-car tire, so it will tow easily.

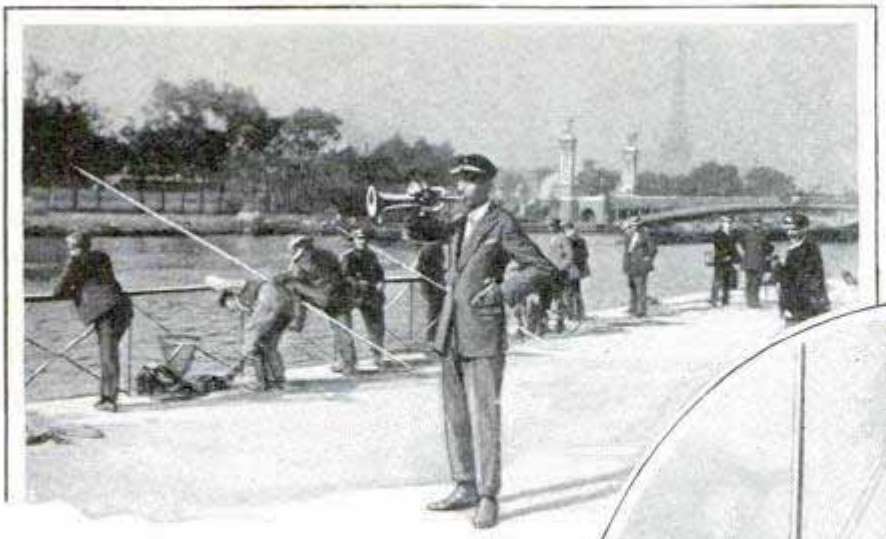
In the northwest, there are folks who do most of their fishing with wheels, somewhat resembling the model of an old-fashioned water-power grist-mill wheel. In the Andaman isles, the commonest method of fishing is with a bow and arrow. Of traps and spears you've heard often, and need only a passing reminder. But do you know about the barbed fork, shaped like old Neptune's, which is the favorite method of some British seaside fishermen? They call this system "butt-pricking." Or do you know the style among inland Missouri lads when they go



out to a creek after a mess of crayfish? A pole, a line and some bait are used—but no hooks. On the end of his string, the young angler ties a hunk of liver or "dog meat." He holds his pole in the left hand, a homemade dip net in the right. When he feels a nibble on his line, he scoops the net swiftly upward and gets Mr. "Crawdad" out before that miniature fresh-water edition of a lobster has time to unfasten his meat hooks from the meat and scuttle away.

Upper Photo © Ewing Galloway

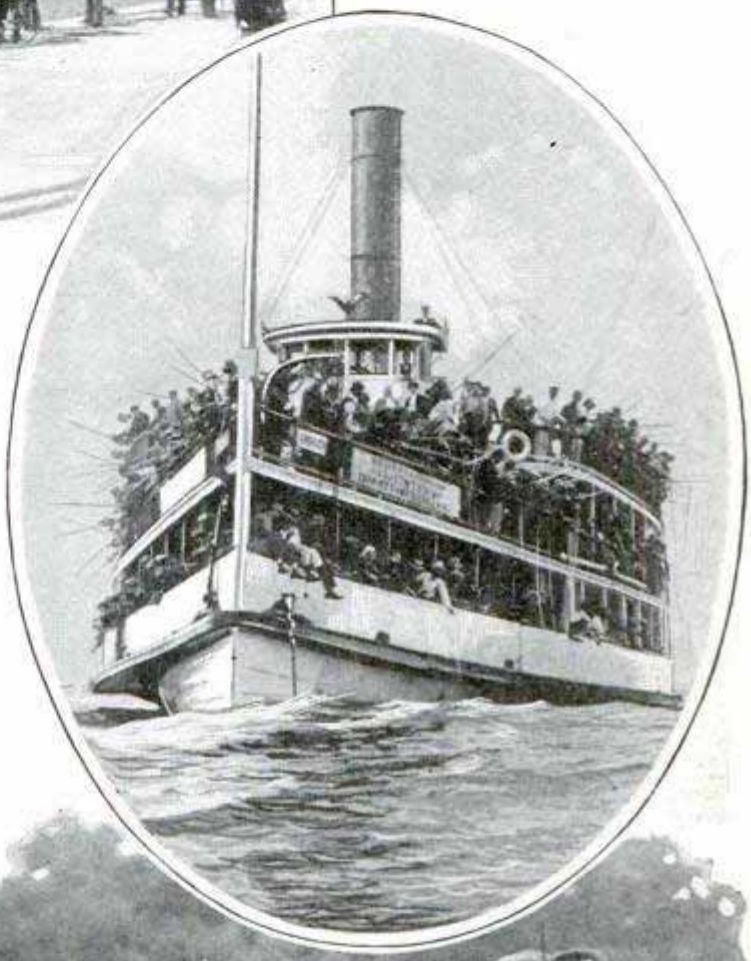
Poised on the Springboard-Like Bowsprit of His Hollow Canoe, the Native of the Andaman Islands Does His Fishing with a Bow and Arrow; Reed Fish-Trap Makers of Naples at Work, Below

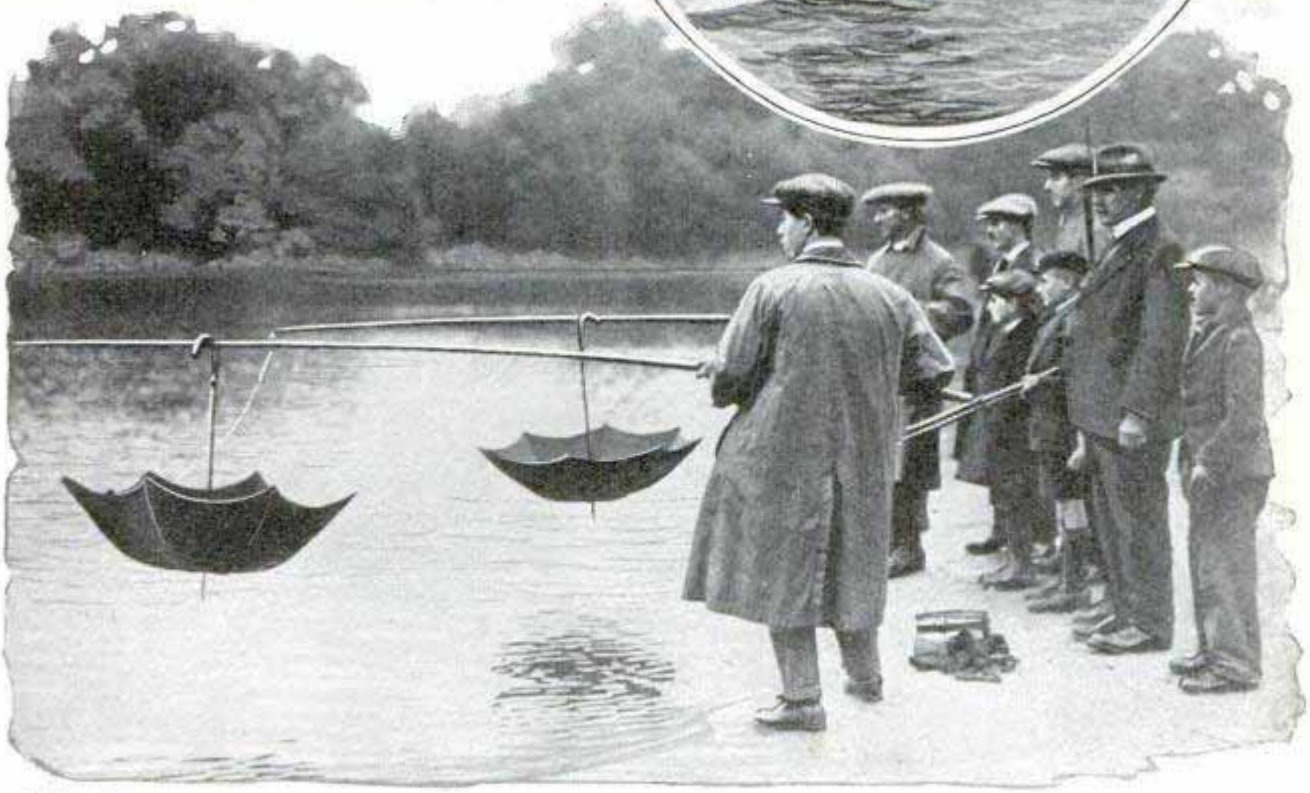


The Fishing Competition for the Championship of the River Seine Anglers in Paris Is Opened with a Flourish, When a Bugler Sounds the Signal for All the Devotees of Rod and Line to Start Baiting Their Hooks

Most of us Americans prefer to do our fishing usually in solitude. Not so in the case of some of the fishermen of the great cities. The season in Paris, for example, opens upon the banks of the Seine with a military blare of trumpets as its signal—the greatest "eclat" in the world to effect the capture of a few measly little porgies.

New Yorkers, who live and work in high-storied apartment houses and skyscraping office buildings, often do their fishing, likewise, in layers. Many big





© Keystone

Bottom, Highgate Fishermen, in England, Hang Umbrellas on Their Rods Because the Fish Flock to the Shadow; New Yorkers, Center, Go Fishing in Tiers, Just as They Live

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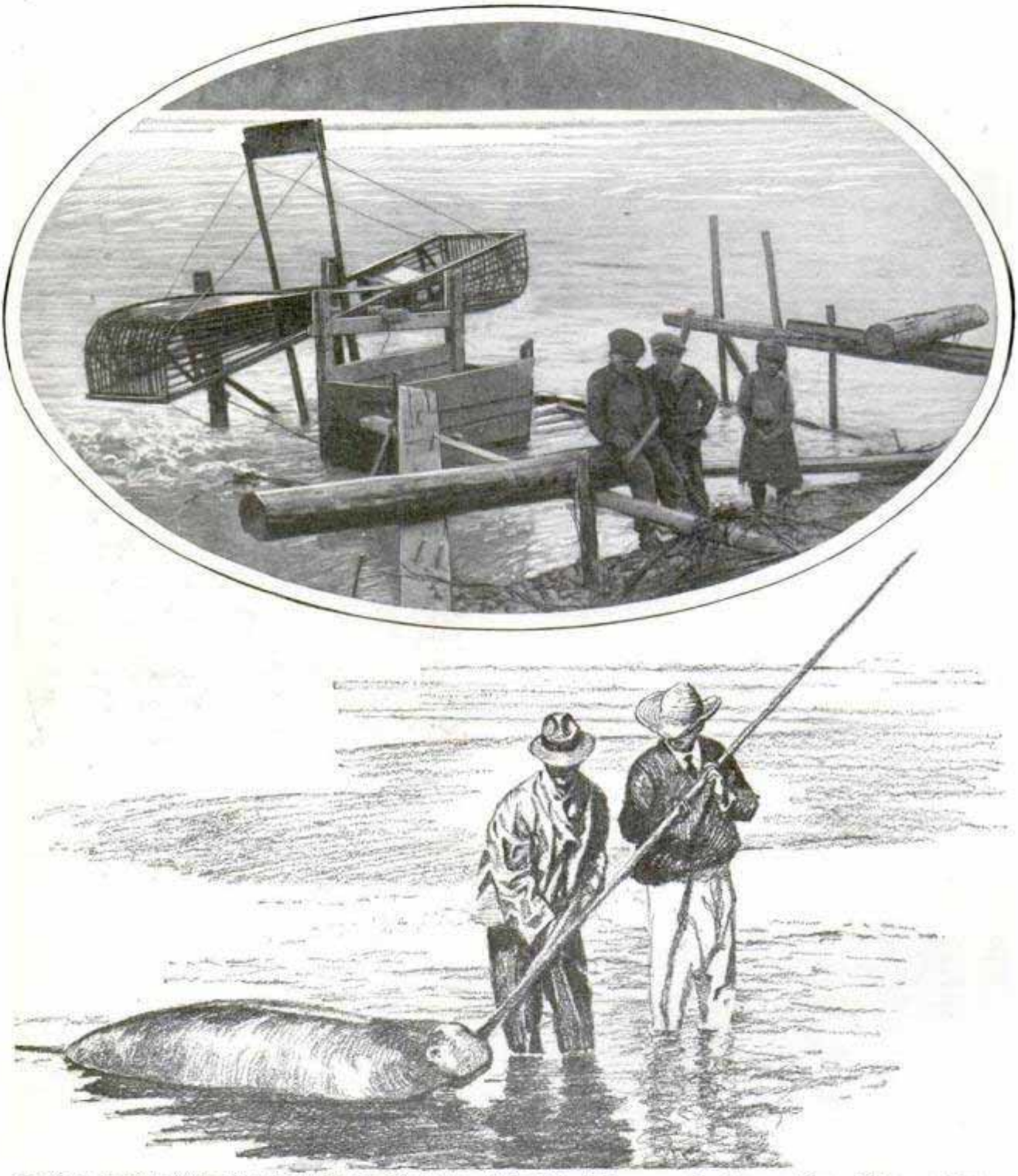


Letting the Fish Wheel Do the Work Is One Way of Catching Salmon on the Copper River; Below, a Manatee, or Sea Cow, Getting Prodded Around off the Coast of Florida

fishing boats put out to sea every day in the season with eager fishermen crowding the rails of several decks. The moment the anchor drops at a fishing bank off the New Jersey coast, a sound like a sudden spatter of hail stones on the water greets the amazed voyager's ears—and from all tiers of decks he sees scores of lines radiating. Another great to-do follows, naturally, when anyone hooks a fish. For at least two or three other fishermen's lines are likely to be fouled with the one which has landed the prize.

Chicago is another city which deserves mention as a national headquarters for one of the curiosities of angling. Nearly any day in summer you can find a group of earnest shirt-sleeved sportsmen casting from a platform into a little lake of the city park system. These eager fishermen you learn next—to your amazement—would likely drop dead of heart failure

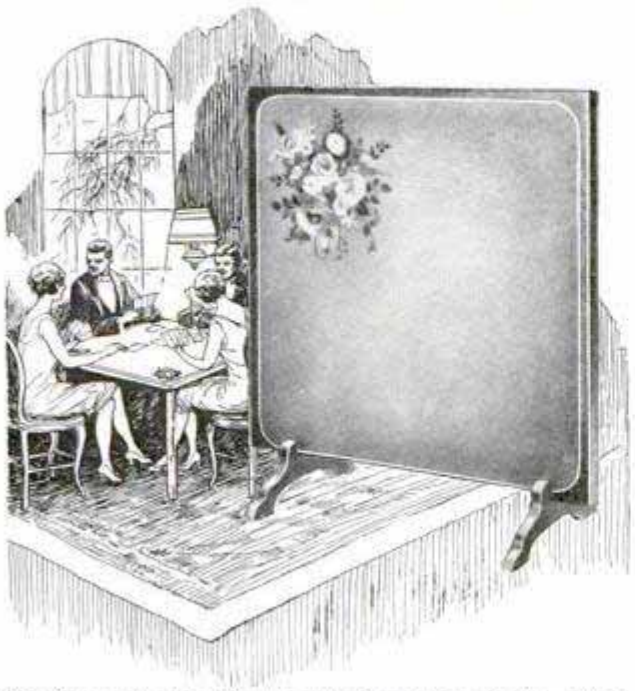
(just as a Parisian might if he ever pulled a fish up out of the Seine) should any bass or pickerel in that little lake strike on their line. No! These fishermen are practicing only to improve their skill as bait casters or to win prizes in the casting tournaments held there.

BUTTERFLY WINGS TELL STORY OF WANING ICE AGE

In the patterns and changing colors of butterfly wings, is inscribed a graphic record of changing conditions on the earth's surface, according to a western naturalist. He declares that, as the climate grows colder, the wing colors are less brilliant and the present trend away from the days of the glaciers, has been marked by increasing brilliance of the hues. He asserts that it would be possible to predict what the patterns will be, on the wings of certain species of butterflies, 10,000 years from now.

TABLE AND FIRE SCREEN IN ONE SAVES HOUSE SPACE

A card table that serves as a fire screen when not needed for a game, has been introduced, to save space and afford extra usefulness. It has folding legs, like the ordinary tables of this kind and is simply set in sturdy bracket-shaped legs when it is to be adapted as a screen.



Fire Screen in Position for Placing before Grate, and in Use as a Card Table

Sliding Tower with Its Winding Bamboo Dragon in Which Riders Shoot to the Bottom

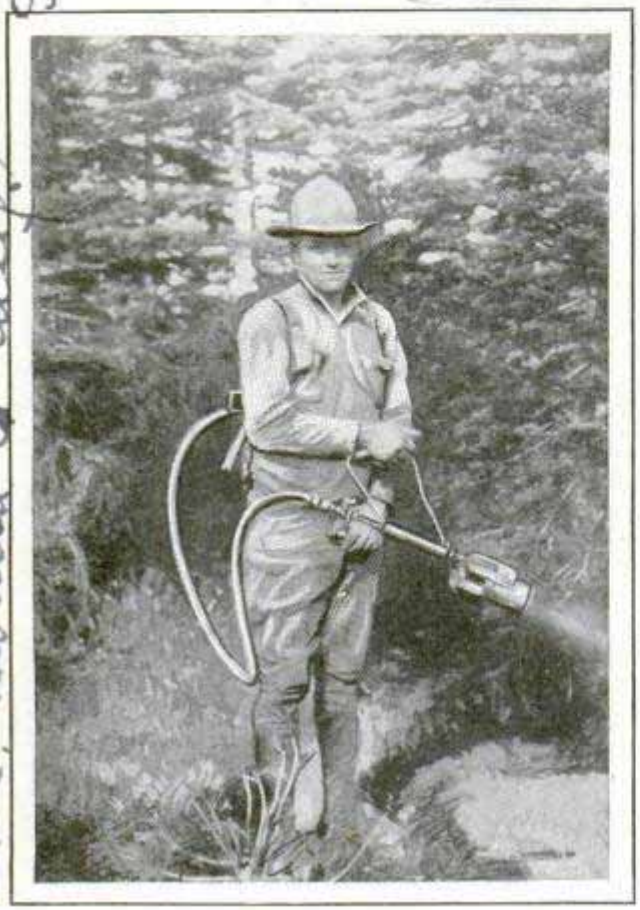
SLIDE DOWN BAMBOO DRAGON GIVES RIDER THRILLS

One of the latest amusement devices at a western park is a spiral dragon made of bamboo. The rider sits on a leather cushion and shoots from the top to the bottom, a distance of 382 feet, in about twelve seconds. The spiral adds to the enjoyment of the ride, and, since the chute is entirely inclosed, there is little hazard.

DYNAMOS ARE TESTED BY RADIO TO REVEAL HIDDEN DEFECTS

Imperfections in dynamos are plainly revealed by a radio test. The unit is converted into a broadcasting station by sending a 200,000-cycle current through it, then picking up the waves on a receiving set. If the dynamo is in perfect condition, a loud buzzing is heard and there is a high reading on a milliammeter, but if it is defective, the buzzing is more subdued and a much lower reading is recorded.

GASOLINE "GUN" FOR BACKFIRES HELPS PROTECT FORESTS



To Speed the Starting of Backfires; Blow Gun That Shoots Gasoline on Forest Brush

Fighting fire with fire is a familiar method of combating forest and other blazes, and to aid in starting the backfires that sometimes prevent the spread of the main conflagration, the forest service in California has been using a gasoline spray gun. The liquid is sprayed out with air pressure and ignited, forming a blowtorch which is effective in rapidly igniting brush and other growths. One man can easily operate the outfit, which holds a supply of fuel sufficient for extensive operations.

WINTER STORMS GROW FASTER BY NIGHT THAN DAY

Why the winter cyclones, or circular storms which move in regular order across the United States from the southwest to the northeast, grow larger by night than they are by day, and also increase in size and intensity as they proceed up over New England and out to sea, was explained recently by Dr. W. J. Humphreys, meteorological physicist of the U. S. weather bureau, in an address before a scientific meeting at Nashville, Tenn. The storms consist of a swirl between cold air from the north on the northwestern side of the cyclonic disturbance, and warm humid air from the south on the southeastern side of the storm area. The southern side, because of its moisture content, is cloudy, while the northern side is clear. As the storm moves northeastward, the clear side tends to become still colder, while the southern side loses but little heat, owing to continuous condensation of the moisture. As the difference in temperature between the two sides increases, the difference in air pressure, and hence the force of the winds, also grows, with the result that the storm expands and grows more severe. At night, the cool, clear section of the storm grows colder through loss of heat by radiation, while the warm side again changes little in temperature, and there is still further increase in intensity. In the daytime the warm side again suffers little change, while the cool side picks up heat rapidly, with consequent contraction of the storm area.

FLOWERS CUT IN SHEET METAL RIVAL NATURAL BLOOMS

Realistic flowers are being fashioned from sheet metal by an English craftswoman. She carefully sketches the blossom she is to reproduce, then cuts out the pattern, twisting leaves and petals until they conform to the shape of the original.

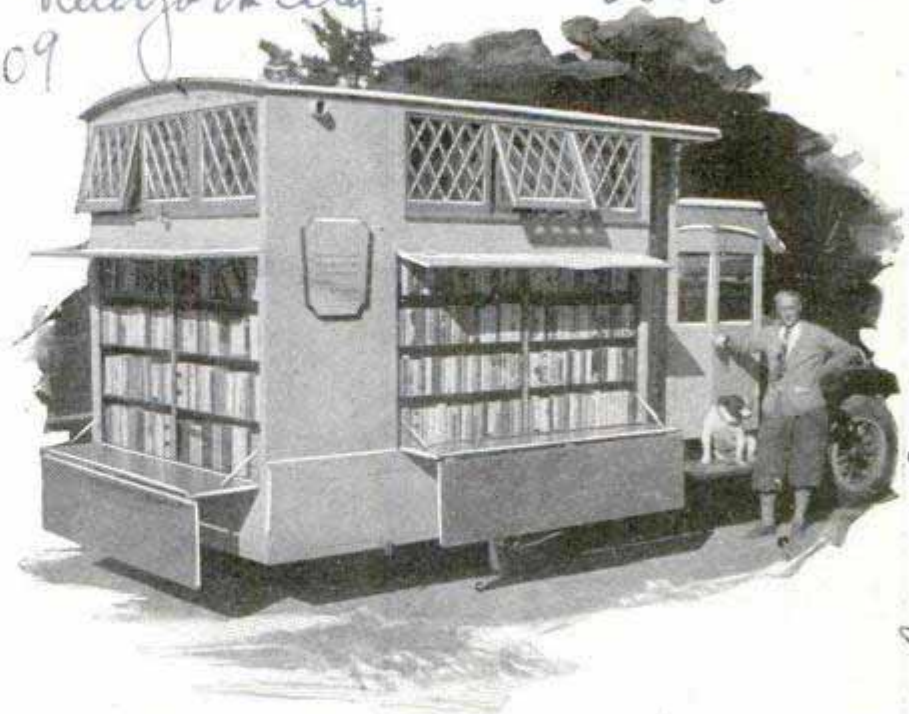
Making Sketches for the Flowers, and Some of the Finished Pieces Cut from Sheet Metal

After the flower is fabricated it is painted with realistic colors.

¶Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

HEALTH MENACED BY DARK HOUSES EXPERT SAYS

Dark, dingy buildings that prevent the light from reaching down to the sidewalks of the cities are worse than higher ones with bright, light-reflecting surfaces, in the opinion of an eastern expert. He declares that light and not height ought to be the chief concern of the zoning authorities. A coating of soot is worse than ten extra stories, he says, as a dirty building "sops up the light," preventing it from reaching those who need it. Plentiful supplies of clean fresh air are necessary for health in the city, he realizes, but points out that sunlight is one of the most efficient of all cleansers and lack of it means danger to health.



Living Quarters and a Bookstore in Auto; the Traveling Home Has Running Water and Other Conveniences

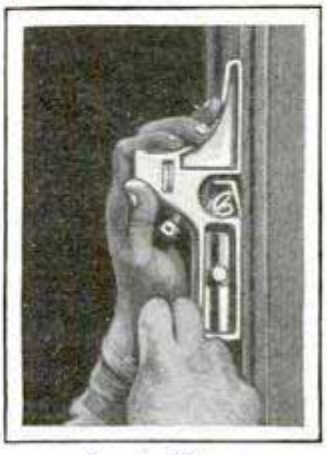
BOOKSTORE HOME ON WHEELS HAS MANY COMFORTS

Besides carrying his stock of books, an automobile operated by a California man has living accommodations for himself and his wife. There are two berths, a sink with running water, gas stove, ice box, radio and other conveniences of a permanent dwelling. The books are displayed for sale by lowering shelves at the sides, are securely protected from dust and damage, and there is a special case for rare volumes and first editions. The outfit was planned for a six months' tour.

WRITING IN THE DARK IS EASY WITH FLASHLIGHT PENCIL

A slight push on the end of a pencil, recently introduced, lights a small lamp at the tip so that the user can easily write in the dark. Batteries for the light, and extra leads, are carried in the pencil barrel.

RABBET PLANE WITH MARKER HELPS IN SETTING LOCKS



For setting hinges and locks, and other purposes, a combined rabbet and router plane with a gauge and marker, is especially adapted to fine and intricate work. The bit is adjustable up and down and has a range of half an inch below the bottom surface. The gauge is also suitable for a handy square.

SIGNAL WARNS OF PUNCTURES TO PROLONG TIRE LIFE

If the automobile tires are punctured or air leaks out to a harmfully low pressure point, a light signal flashes on the dash so that the driver can remedy the difficulty and prevent undue damage to the tires. This is possible with an attachment devised by a Nevada man. The instrument is simply a pressure indicator set within the inner end of the valve stem.

VENDING MACHINE TO SELL PIE, SANDWICHES AND CANDY

Slot Machine That Sells Dime Lunches and Gives Buyer a Choice of Different Kinds

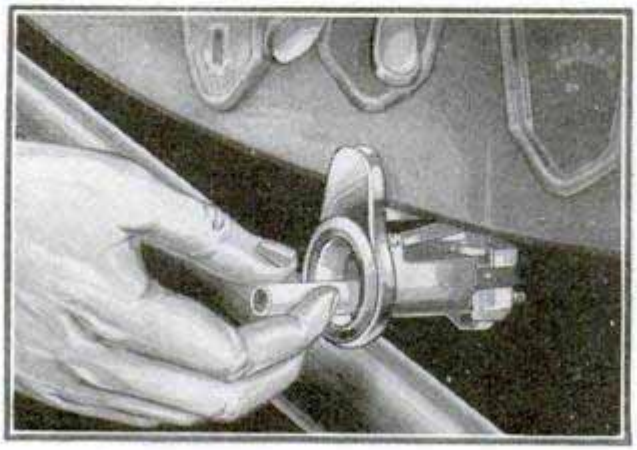
A vending machine, which gives the purchaser a choice of as many as twenty-five items, has been invented primarily to sell package lunches, though it can also supply sandwiches, cuts of pie, packages of candy or similar articles. A basic patent has been granted on the idea of delivering the merchandise through the center of a circular machine, by which the various items can be revolved to bring any desired one to the delivery point. In operation, the customer turns a knob to revolve the wheel until the desired package is brought to a window marked by an arrow. He then inserts his dime in the slot and presses a lever, which releases the package and causes it to drop to the delivery opening. A safety door covers the aperture through which the packages leave the wheel, making it impossible to rob the machine by inserting a rod or wire, and the coin mechanism is so carefully adjusted that it not only rejects slugs but even returns badly worn dimes. The machine can be completely disassembled within a few seconds by unlocking two locks. To load it, it is only necessary to operate the front lock. The coins are dropped into a locked removable bank, two of which come with each machine, and the attendant merely changes the bank, without access to the money.

ETHER WAVES USED IN RADIO TO HELP TREAT DISEASE

Medical science is reported at the threshold of another victory in the announcement that ether waves which have been harnessed for radio, may prove beneficial in the treatment of various diseases, particularly pneumonia. It has been noticed that operators exposed to the waves experienced a sudden rise in body temperature. Doctors believe that the waves may therefore be utilized to restore normal temperature to a person who has been suffering from such a malady as pneumonia, when the patient is in danger of a collapse after the crisis through failure of the body to retain its normal heat.

SELF-LIGHTER FOR AUTO DASH HAS NO EXTENSION CORD

A cigar and cigaret lighter that ignites the tobacco without raising the lighter to the lips is the newest accessory for the automobile instrument board. It eliminates the usual extension cord. The "smoke" is simply pushed into the lighter tube, left for a moment, and then withdrawn, lighted. It cannot fall out for, in entering, it raises a small hinged door, the weight of which holds the cigar or cigaret in place. Lifting of the door closes an electric switch to the heating element, and when the smoke is withdrawn, the door drops, stopping the flow of current. The device is arranged to be clamped onto the lower edge of the instrument board, so that no holes need be drilled.



Cigar Lighter Which Requires No Extension Cord to Raise It to the Lips

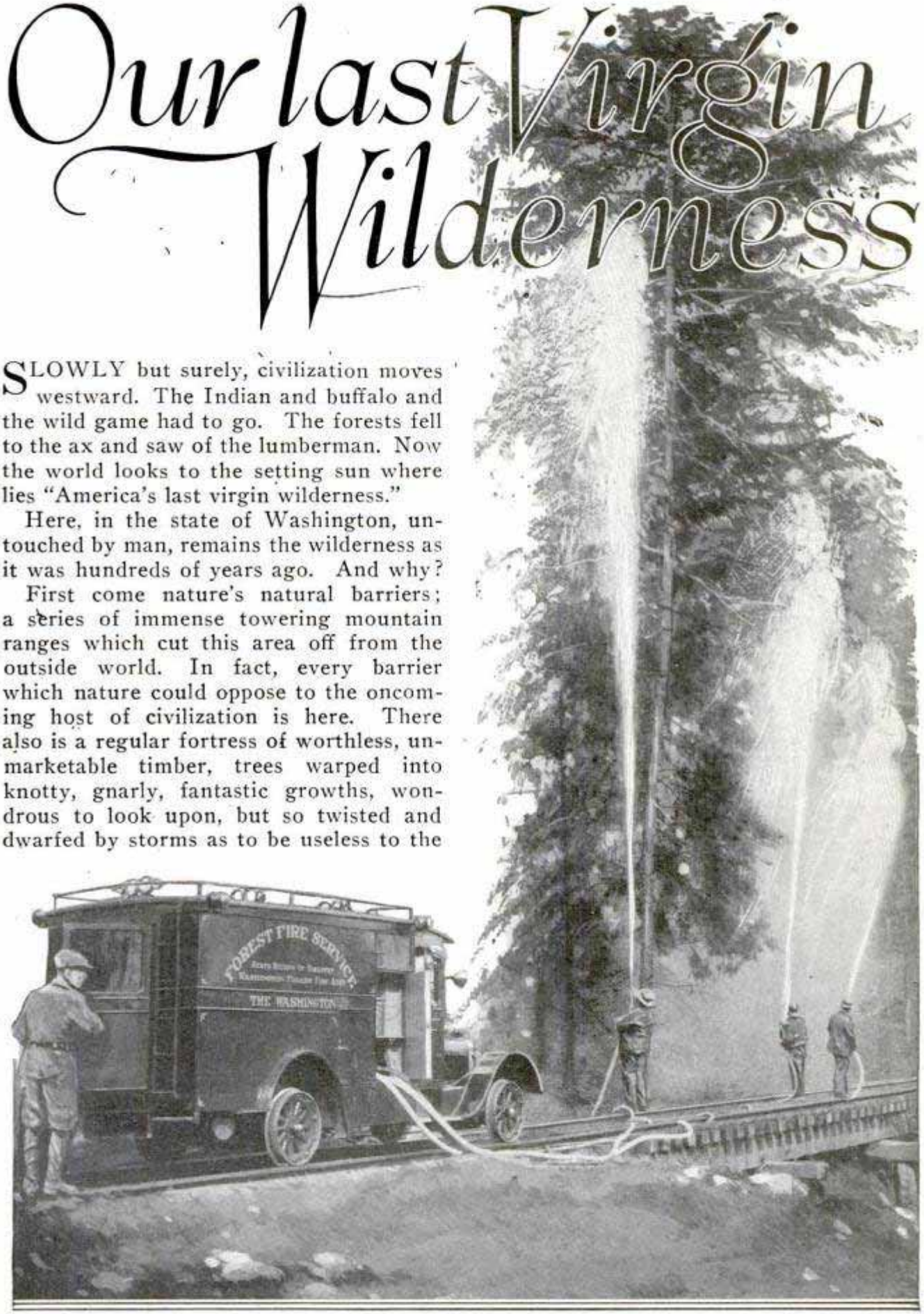
2736

Our last Virgin Wilderness

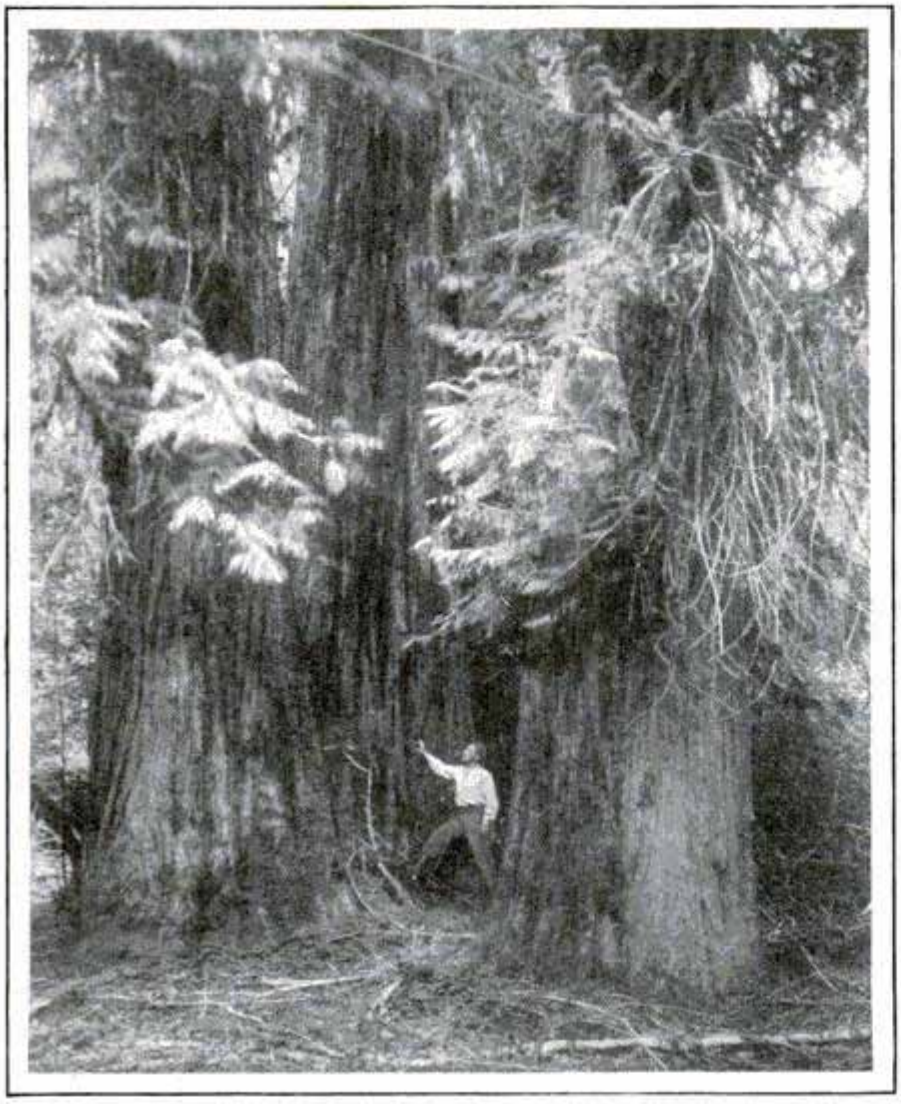
SLOWLY but surely, civilization moves westward. The Indian and buffalo and the wild game had to go. The forests fell to the ax and saw of the lumberman. Now the world looks to the setting sun where lies "America's last virgin wilderness."

Here, in the state of Washington, untouched by man, remains the wilderness as it was hundreds of years ago. And why?

First come nature's natural barriers; a series of immense towering mountain ranges which cut this area off from the outside world. In fact, every barrier which nature could oppose to the oncoming host of civilization is here. There also is a regular fortress of worthless, unmarketable timber, trees warped into knotty, gnarly, fantastic growths, wondrous to look upon, but so twisted and dwarfed by storms as to be useless to the



Forest Rangers Testing a New Rail Motor Car, Equipped to Fight Forest Fires in the Virgin Timber of Washington; the Powerful Pumps Draw the Water from the Nearest Stream



Courtesy of Ashael Curtis

A Stand of Big Cedars in the Olympic Forest Preserve; Many of the Trees Are 200 to 300 Feet High

lumberman. These trees of the upper slopes act as sentinels and guardians of the wonderful forest growth hidden in the shadowy valleys just beyond.

Another reason for the isolation is the great precipitation. Such a rainfall is hard to understand without an explanation as to the natural causes. The Olympic range rises almost abruptly close to the shores of the Pacific ocean. The moisture-laden clouds, rolling in from the sea and driven by a steady west wind or heavy gales, hit this range, with its snow caps and glaciers, at 8,000 feet elevation. The cloud moisture is then condensed and precipitated in the form of a heavy rain to deluge the great forest area and undergrowth, which quickly absorbs the water, the rivers carrying the surplus. The maximum rainfall in this area of western Washington is 250 inches per year, while the minimum in eastern Washington is sixteen inches per year.

Theodore Roosevelt was one of the first to recognize the wonderful value of this spot and he set it aside as a national monument, an area of fifty-five square miles, to be a home for the preservation of the wild elk of the region. Today there are over 7,000 of these animals roaming within its boundaries.

In 1921 an unusual tornado swept over this forest area, tearing down its giant trees and stacking them high on one another like boxes of immense loose toothpicks. The summer weather dried out the dead branches of the fallen timber and a fire hazard was present of immense proportions. The government and state authorities realized the danger and through the forest rangers' service a guard has been kept day and night ever since. There are three entrances to this vast area. These are at Lake Crescent, Lake Quinault and the Dosewallips. Here armed guards are stationed day and night. Automobiles are stopped, every passenger must get out and register and give full name and address; then they are given a signed permit to enter the forest reserve. A large sticker is pasted on the windshield which reads, "no smoking," and informs the passengers that no fires are allowed except at points designated by big signs and under the immediate supervision of guards.

The forest-fire service has equipment peculiar to its calling. Last season they used a new super fire engine, a big auto truck with flanged wheels, made to run on any railway track. It carries three lines of hose from a master pump, throwing water to a height of eighty feet and pumping 300 gallons a minute from any near-by stream. Through a system of

3928

five pumps and canvas bags, water can be relayed for a distance of two miles. Where railway tracks are not available, auto trucks equipped with fire-fighting pumps and water tanks, are used. Larger tanks situated at various points, are provided for refilling the truck tanks when needed. To reach forest fires where auto trucks are unavailable, a smaller portable pump is used. One weighs seventy pounds, with straps attached to the pump base. A man packs this on his back to a stream where it is set up and put in operation. Co-operative lookouts are stationed at all the highest points, particularly overlooking the entire Soleduck Burn. Airplane observation is carried on only during the hot, dry periods.

Upon leaving the forest area, armed guards stop you again and your party is checked out. It must be the same as you checked in. Here your permit is stamped "canceled" and, before you depart, though you do not know it, a ranger has filed his report upon you.

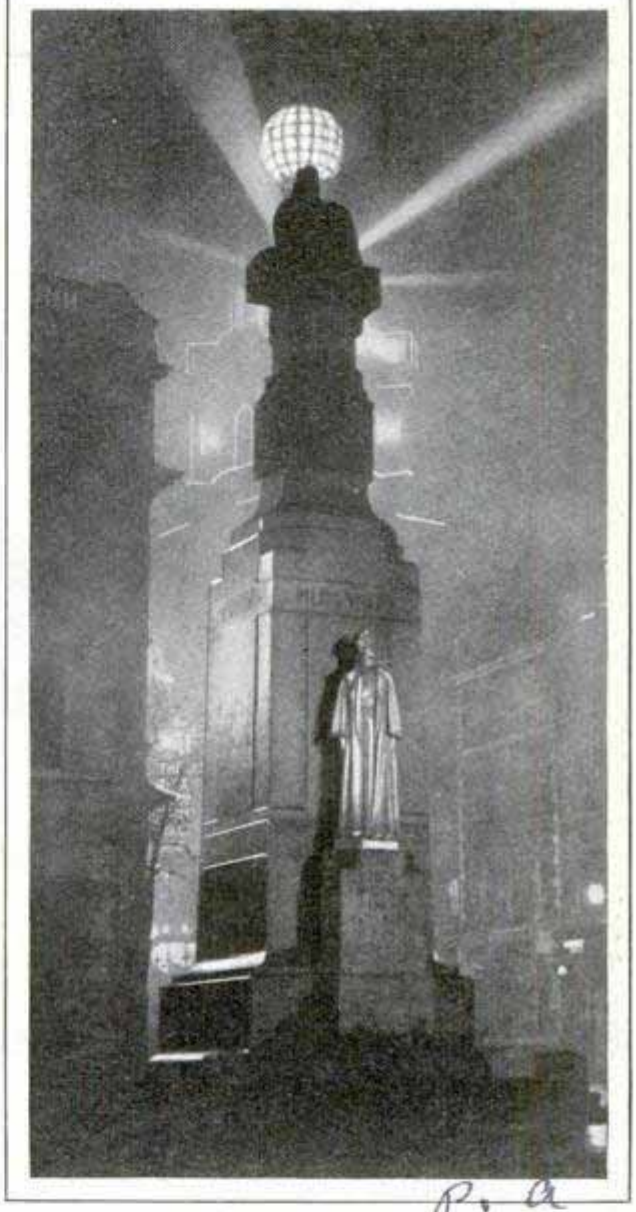
TOY CANNON THAT SHOOTS GAS ELIMINATES DANGER

3029

Safety is the outstanding feature of a toy cannon that produces a loud report and gives youngsters much amusement with practically no risk. The "shell" is merely a charge of a carbide compound and ignition is accomplished by a spark from a flint on the hammer.

It Makes a Loud Report, but Shoots No Bullets; Toy Cannon That Explodes a Charge of Gas

A. C. McClurg Co,



P. a

Where Night Sometimes Comes at Noon; Trafalgar Square, London, as It Appears in a Dense Fog

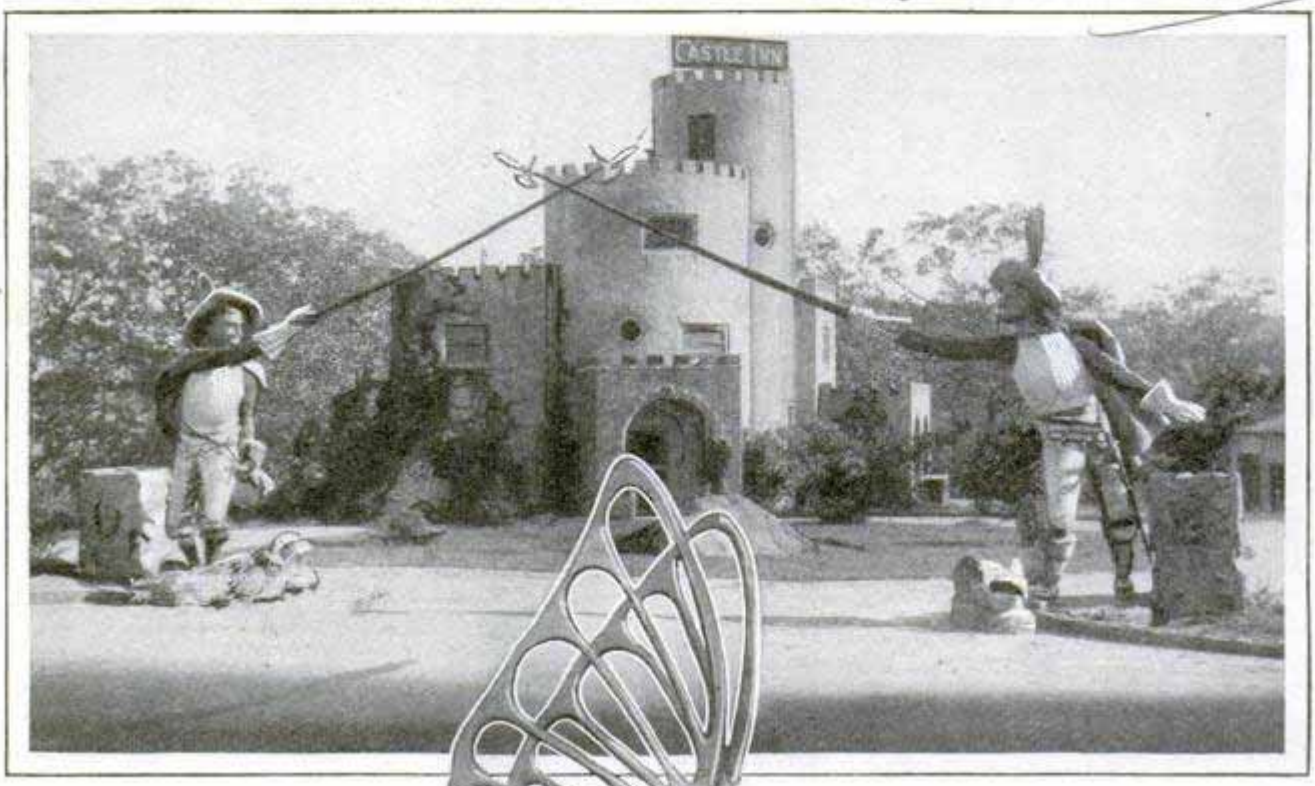
LONDON NIGHTS AT NOONDAY DURING HEAVY FOGS

Dense fogs, hovering over ~~London,~~ frequently plunge the city into a darkness almost as deep as that of night. How completely the light of the sun is obscured, is shown by the accompanying photograph of Trafalgar square. In the foreground is the ~~Edith~~ Cavell memorial statue with illuminated buildings in the background, all completely lighted as though for night, but the time was nearly noon. This particular fog was most intense over the central part of the city and lasted all day.

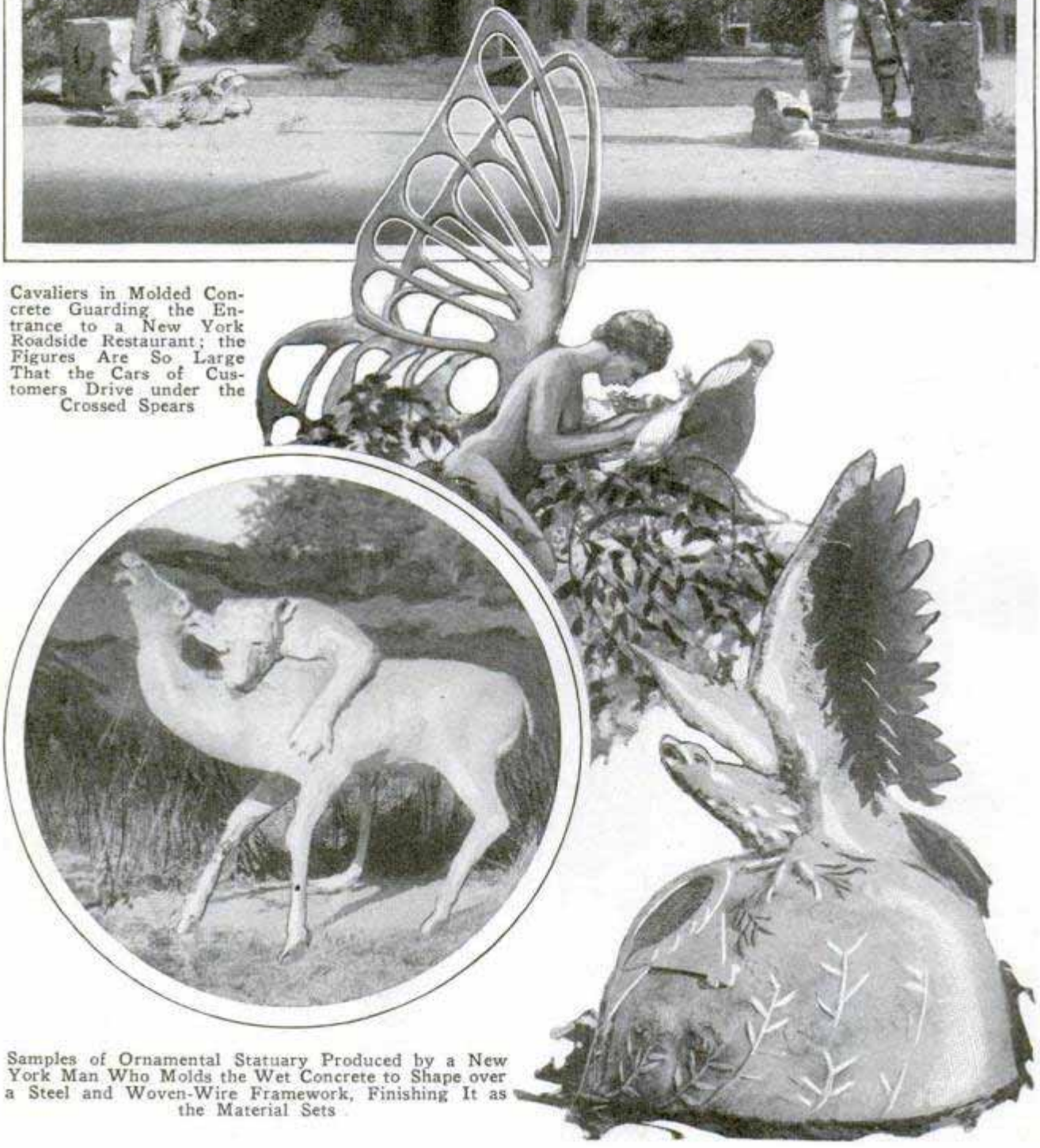
¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine.

Builder Theophilus A. Brouwer, Pine-wold Park Westhampton, NY. 39 14

FREE-HAND SCULPTURE IN REINFORCED CONCRETE



Cavaliers in Molded Concrete Guarding the Entrance to a New York Roadside Restaurant; the Figures Are So Large That the Cars of Customers Drive under the Crossed Spears



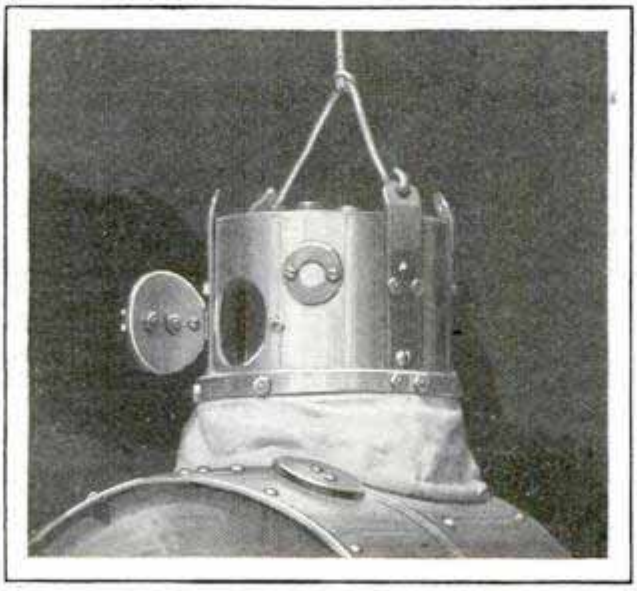
Samples of Ornamental Statuary Produced by a New York Man Who Molds the Wet Concrete to Shape over a Steel and Woven-Wire Framework, Finishing It as the Material Sets

FLEXIBLE SPRING STRIP HOLDS CASEMENT WINDOWS OPEN

A simple check to hold casement windows or doors open in any position has been invented by a Utah man. It has no setscrews, and there is nothing to tighten or loosen when the window or door is to be opened or closed. A small brass plate, shaped somewhat like half a hinge, with two eyes for a pin, is attached to the window frame. A strip of thin spring brass, six to ten inches long, for different-size windows, with a loop bent in one end, is hinged to the plate. Two U-shaped brass strips are screwed to the window, the flexible strip passing under them. As the strip is bent when the window is opened, the pressure against the holder nearest the frame will keep it securely in any desired position.

CHAMBER TO FREE SEA VICTIMS TRAPPED IN SUNKEN BOATS

To rescue persons trapped in sunken submarines or other craft, a chamber device has been proposed that can be lowered by almost any vessel equipped to handle buoys or that has derricks or cranes for loading cargo. It is intended to rest securely on the hull of the wreck and when the water is pumped out of the lower chamber in the unit, men enter from a compartment above, open a hole in the sunken vessel and effect the rescue of persons inside. Water is forced out by pumps run by electric motors or by compressed-air engines, and a special skirting at the base of the chamber keeps water from entering. The legs of the device are equipped with rubber-tired wheels, so that the chamber can be easily turned to best fit the hull. Lights and observation windows in the compartments are arranged to aid in the operations.



Model of Proposed Submarine Rescue Chamber, Showing Upper Compartment for the Crew

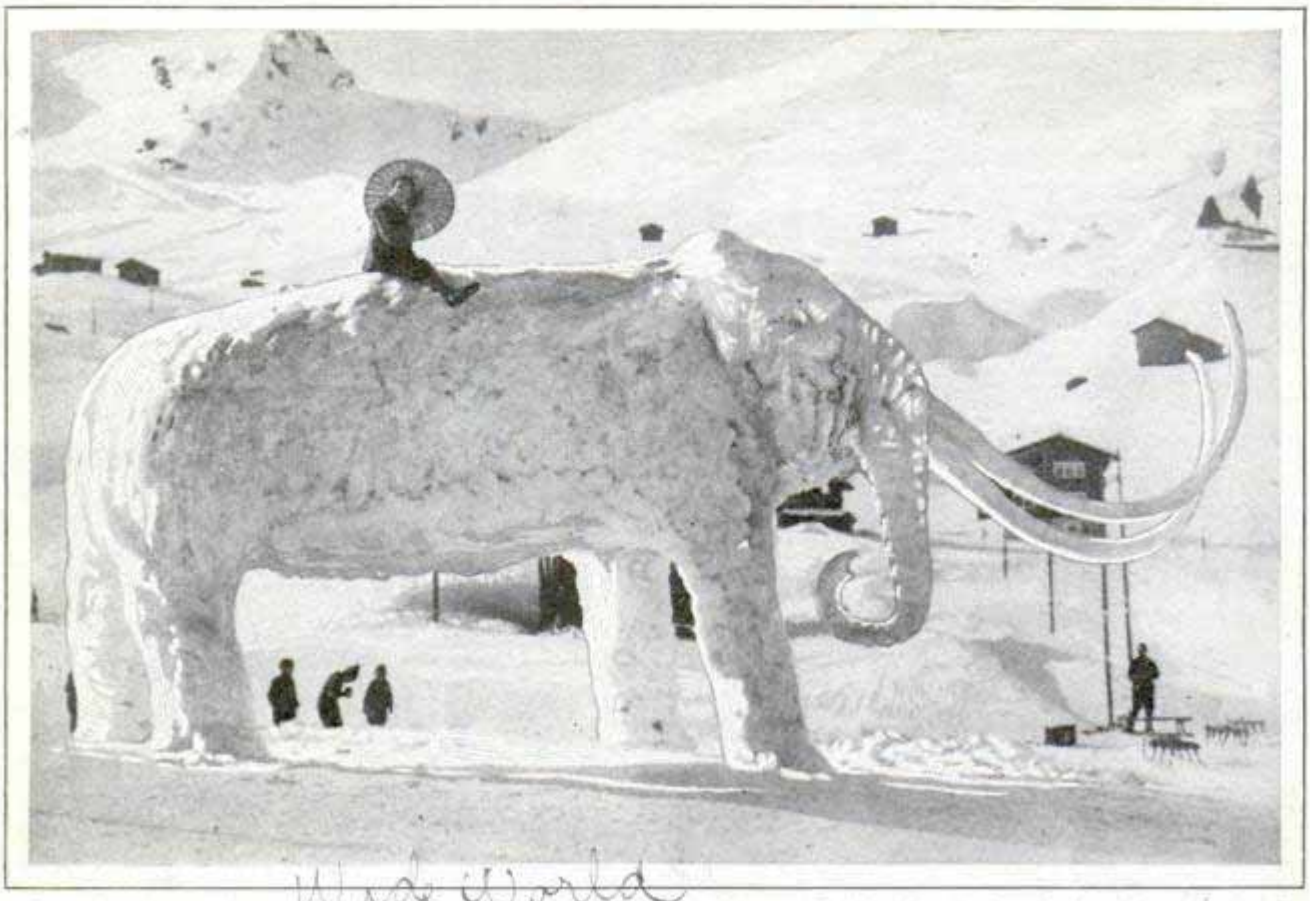
Generating Gas for Cooking a Camp Meal by Blowing with a Chemical Set

CAMPERS GENERATE GAS SUPPLY BY BLOWING ON CHEMICAL

Travelers may have their own private supply of gas for lighting and cooking in an apparatus a German inventor has devised. The gas is generated simply by blowing through rubber tubes upon special chemicals held in a lamp.

FIRST GAS LIGHT A CURIOSITY PEOPLE PAID TO SEE

When the first gas lights were introduced in Baltimore, in 1816, they were placed on exhibit in the museum there and crowds paid admission to see them. Newspaper accounts described them as marvelous "lights without oil, tallow, wick or smoke." The exhibit proved so successful that a gas company was formed the next year, and the streets of the city were soon lighted by the lamps. This was one of the first commercial installations in the United States.



Sun Shades and Snow Sculpture Present an Odd Contrast, but the Bright Sun in the Swiss Mountains and the Glare Make an Umbrella Welcome; the Mammoth Was Fashioned by Visitors at Arosa

SNOW SCULPTURE IS FEATURE OF WINTER SPORTS

One of the events at the opening of winter sports in Arosa, Switzerland, was an exhibition of snow sculpture. Among the models displayed was that of a huge mammoth, fashioned with realistic skill even to the long tusks.

ELECTRIC RANGE OF ALUMINUM COOKS WHOLE MEAL AT ONCE

Operated from a lighting socket, an electric range of aluminum weighs but thirty-five pounds and is so arranged that an entire meal may be cooked at one time. A special feature is that the holders for the utensils may be lowered far into the stove as in a fireless cooker, and are elevated, if desired, by an extension bracket. There are few crevices to collect dirt, a three-point switch gives as many degrees of heat and there is a thermometer to show the exact temperature within the range.

HOW SMALL SILVER CRYSTALS MAKE PHOTOS POSSIBLE

The minute crystals of silver, which coat the sensitive surface of a photographic film and make picture taking possible, are so small, according to Dr. C. E. K. Mees, director of the Eastman Research laboratory at Rochester, N. Y., that a single square inch of kodak film contains more individual crystals than there are people living in the entire world. Talking before a scientific convention recently, Dr. Mees described how, in his laboratory, workers had isolated single crystals under the microscope to study their behavior and the arrangement of the atoms which constitute the crystal. The sizes and shapes of crystals vary in different kinds of film. In the fast negative film which goes into the movie camera, there is a great range of sizes, which enables the cameraman to obtain his wide gradations in shades. The positive film, which is projected in the theater, has grains more nearly of one

size, and this gives the projected picture life and sparkle. The laboratory also found that the sensitiveness of films was not all due to the grains of silver bromide, but was in some way partly creditable to the presence of small grains or specks of some other substance, which turned out to be impurities in the gelatin of which the film coating is made. The impurities came from the plants eaten by the animals whose skins yielded the gelatin. The compound contains a trace of sulphur, and this, it was found, reacts with the silver bromide to form specks.

NEW HYDROGEN PROCESS EXTENDS FIELDS OF WELDING

Metal sheets as thin as paper and alloys containing chromium, aluminum and other elements that usually oxidize or produce fluxes, can now be welded with a hydrogen unit developed by the General Electric company. Metals hitherto unweldable can now be melted and fused without difficulty, since the atomic hydrogen employed reduces the oxides that might otherwise form on the surface. A stream of hydrogen is passed between the arc of two electrodes, the molecules are broken into atoms which combine again, and, in so doing, liberate an enormous amount of heat which affords a more effective welding temperature.

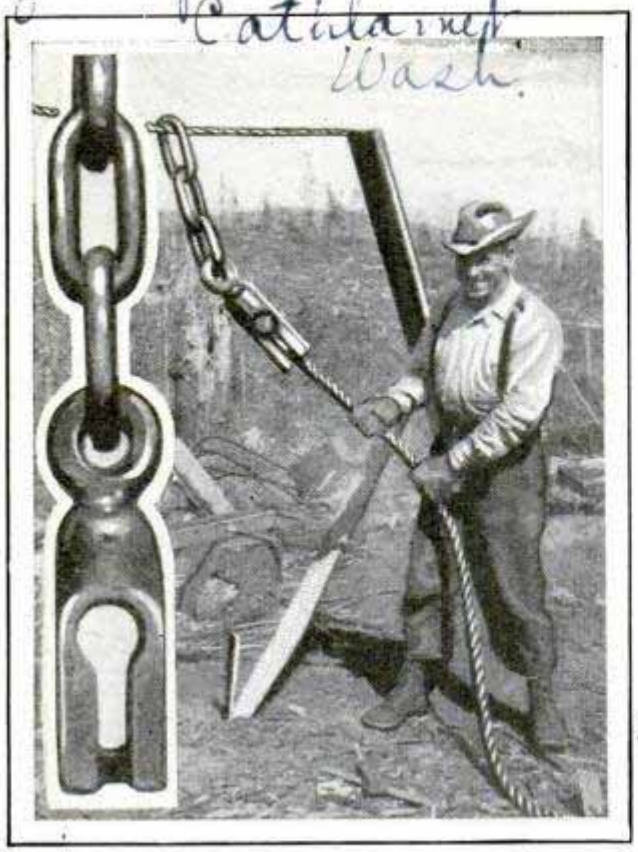
Hydrogen Welding Outfit Which Can Be Used on Many Alloys and Thin Sheets

Airplane-Coaster Ride That Gives Many of the Thrills of Real Flying; Cars Are Propelled by Electricity

RIDE ON AIRPLANE COASTER GIVES MANY THRILLS

Patrons of amusement parks can now enjoy many of the thrills of riding in airplanes, without attendant risks, in an overhead monorail coaster line recently introduced. The cars are built like planes and each is driven by a propeller. The track twists, dips and turns to afford variety in the ride and the entire line may be assembled in a narrow space. Power is furnished from electric motors and operation is automatic, the cars starting when an overhead brake is released while the propellers stop as soon as the "planes" reach a dead section at the finish point. The action of the propeller, and the flexible supports give the approximate effect of flying.

Lightning sometimes paralyzes fish for several days.



Close View of the Hook, and How Easily It Is Connected with Only a Little Slack

IMPROVED HOOK FOR LOGGERS EASILY CONNECTED

Only a slight bit of slack in the line is needed to unfasten a new hook for logging operations and it can be connected in a fraction of a time required with the ordinary apparatus. Features of the unit are an eyelet and slot or crotch, into which the other member is easily fitted.

BETTER AQUARIUM LIGHTING TO IMPROVE DISPLAY

Visitors at the John G. Shedd aquarium, now under construction in Chicago, will have a better view of the tanks as a result of the improved lighting system that is to be installed. Instead of having the illumination directed from above or from behind the pools, it will strike the fish on the side from which the spectators are looking. This is expected to be of special benefit on dark days. The lighting is to be achieved by special construction of the skylights, and the natural illumination will be supplemented by electric reflectors, placed over the water but out of the view of the public, when the days are cloudy. The aquarium will cost about $3,000,000.

COAST GUARD SETS NEW RECORD IN SAVING LIVES

During the last fiscal year, the United States coast guard saved 3,313 persons from drowning, while 14,496 were warned of danger and directed to safety. The guard went to the assistance of ships on 2,791 occasions, the value of the vessels saved totaling $37,801,357. Nearly 450 ships, representing fifteen different nations, are known to have been guided by the ice-patrol service, which advises of the presence of icebergs in the shipping lanes. This information is communicated daily by radio, when the ice is considered to be of particular menace.

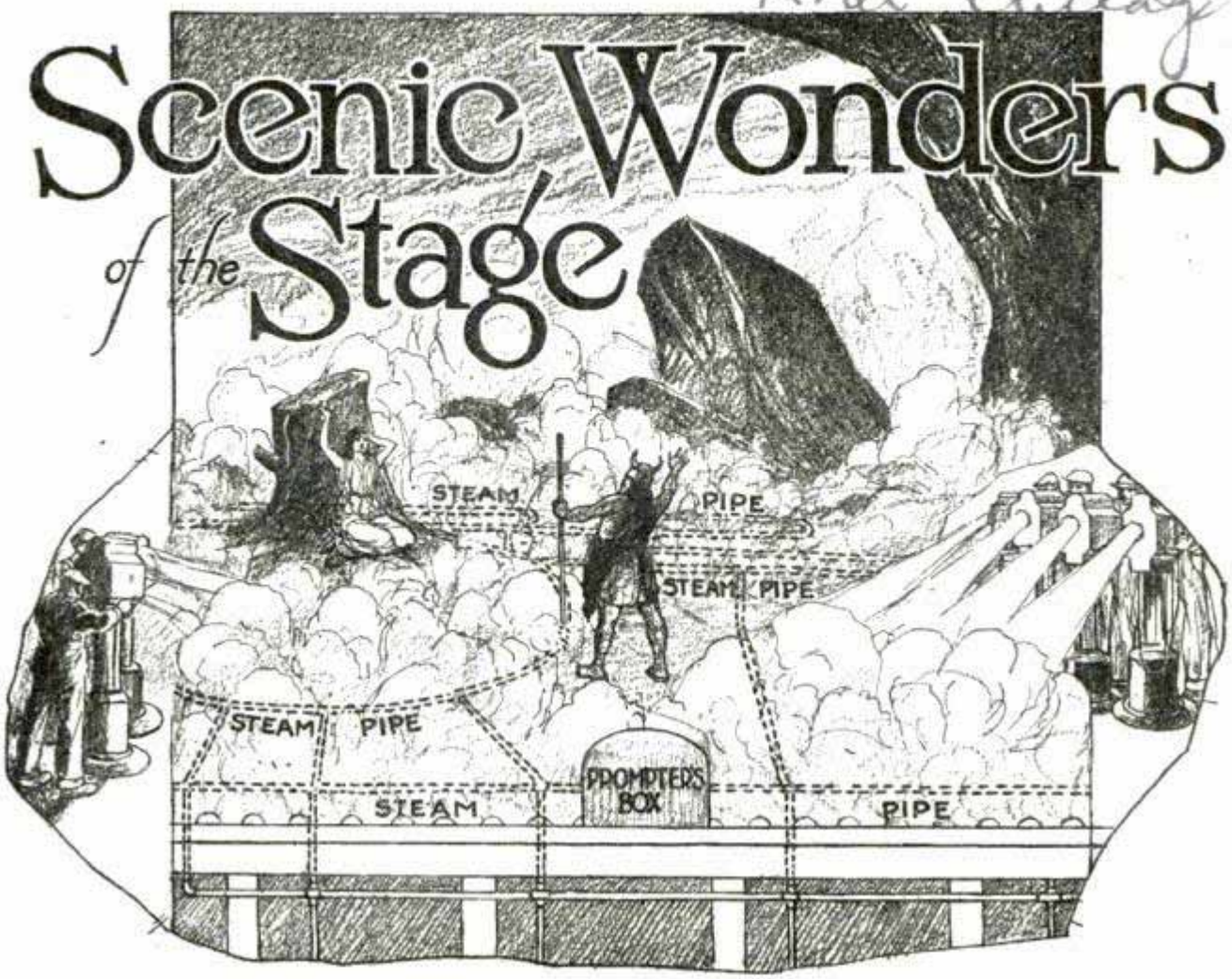
PORTABLE TRIPOD AUTO JACK AFFORDS HIGH LIFT

Both sides of the car are raised at once and to a considerable height with a portable tripod jack introduced in Germany. Its front leg is slotted, the raising hook being rigidly fastened to a threaded shaft, and the footplate at the bottom of the leg adjusts itself to any angle. The shaft is raised with a crank and worm drive, and the outfit weighs but a few pounds.

Portable Jack in Use; Raising Is Done with a Crank and Worm; Car Can Be Lifted to Steep Angle

18 Chicago Civic Opera Co.
E. B. Beeler, Wedgewood Hotel Chicago

Scenic Wonders of the Stage

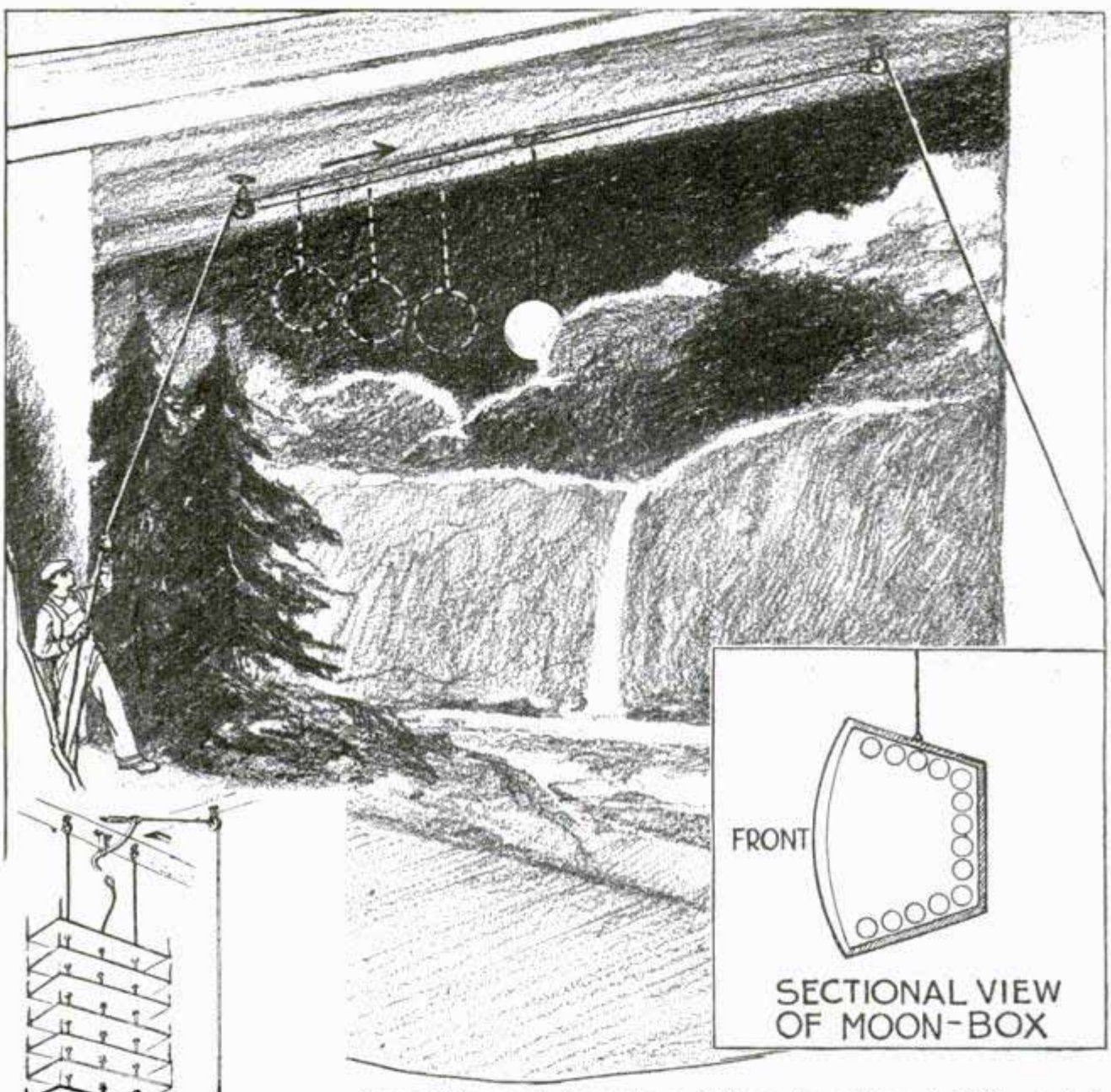


Showing How the Fire Effects Are Produced in "Die Walkure"; Steam from Pipes around the Stage Is Illuminated by Red Light Projected from the Wings

THERE is a sudden crash and bang of falling scenery, then the rattle of a cowbell. In an instant, the stage is plunged in darkness. Samson has just pushed over the temple in the last act of "Samson and Delilah" on the stage of the Auditorium theater in Chicago. The cowbell was not directly connected with the spectacle, but it played an important part, for it gave the electrician the signal to pull out everything on the board for a total "black out." Above the din of the falling properties, the bell could be more distinctly heard than almost any other kind of warning.

The scenery, the temple's massive pillars and other units really fall, but the pieces are so skillfully constructed that they are not broken and do no damage, nor is there any danger for the actors below. This is but one of the interesting stage effects developed for the opera and illustrates the high degree of mechanical exactness necessary for the successful production of a play. In "Die Walkure," a god walks about touching the rocks and, as he does so, steam and "flame" spurt out. The secret is explained by men who are hidden in the wings where they are working a steam valve and red lights. The steam is real, and the men, synchronizing the valve to a split second to accompany the movements of the actor, cause the vapor to burst out and the red light gives the appearance of flame. "Brunhilde" falls asleep in an apparent wall of fire, produced by the steam and the spotlights.

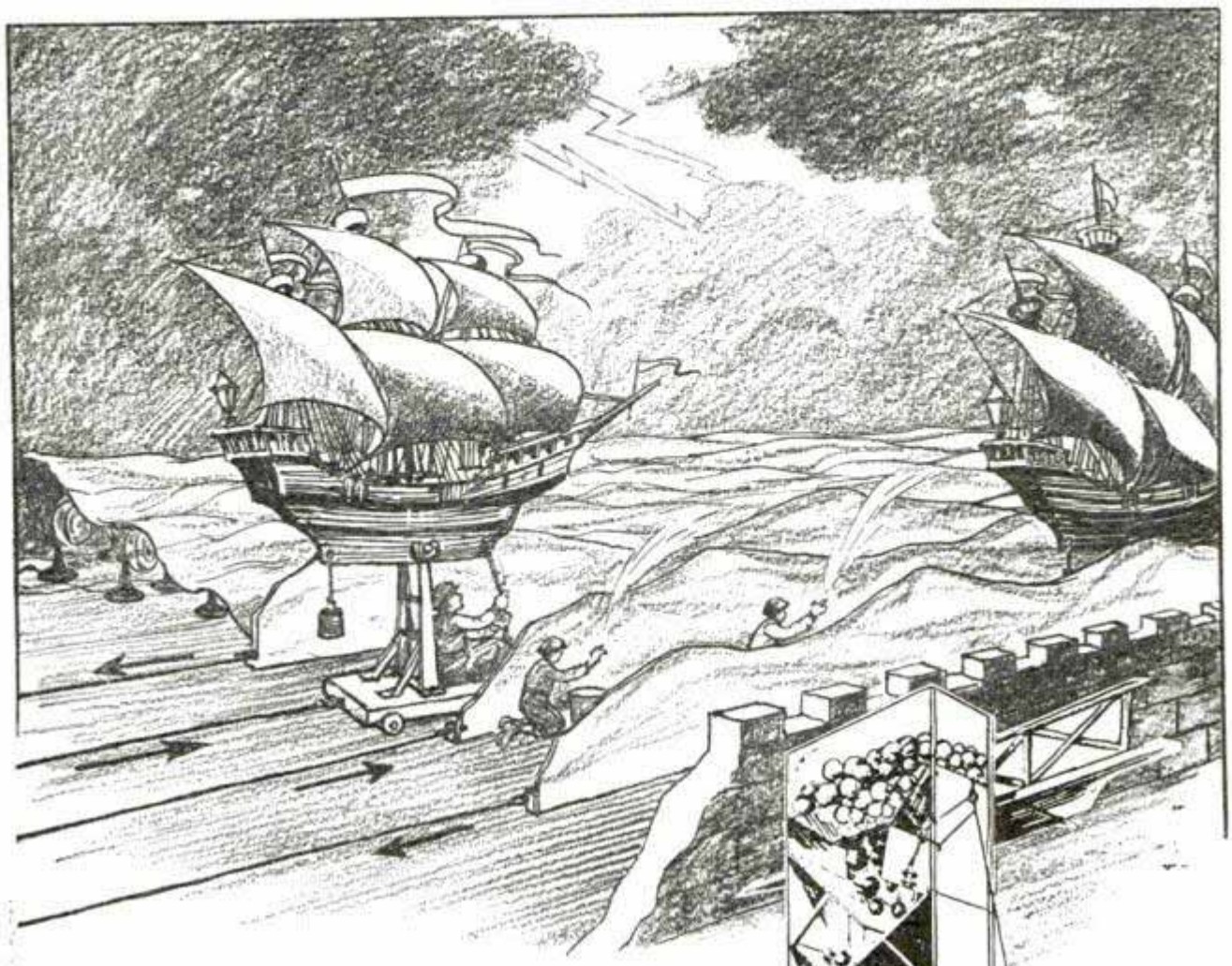
Moving-cloud and rippling-water effects are produced on the stage by means of a rotating lens in front of a strong light. Cloud and water pictures, painted on the glass, are thrown upon the backdrop as the lens moves, and the motions of the shadows are made more realistic by having one disk move faster than the other, thus showing some clouds hurrying past the others. In the Chicago Civic Opera company's production of "Dinorah" real water is used for the waterfall. The supply is pumped back and used again and



Above, Diagram of Apparatus to Raise or Lower Moon to Different Positions; Left, a Thunder Maker of Collapsing Boards

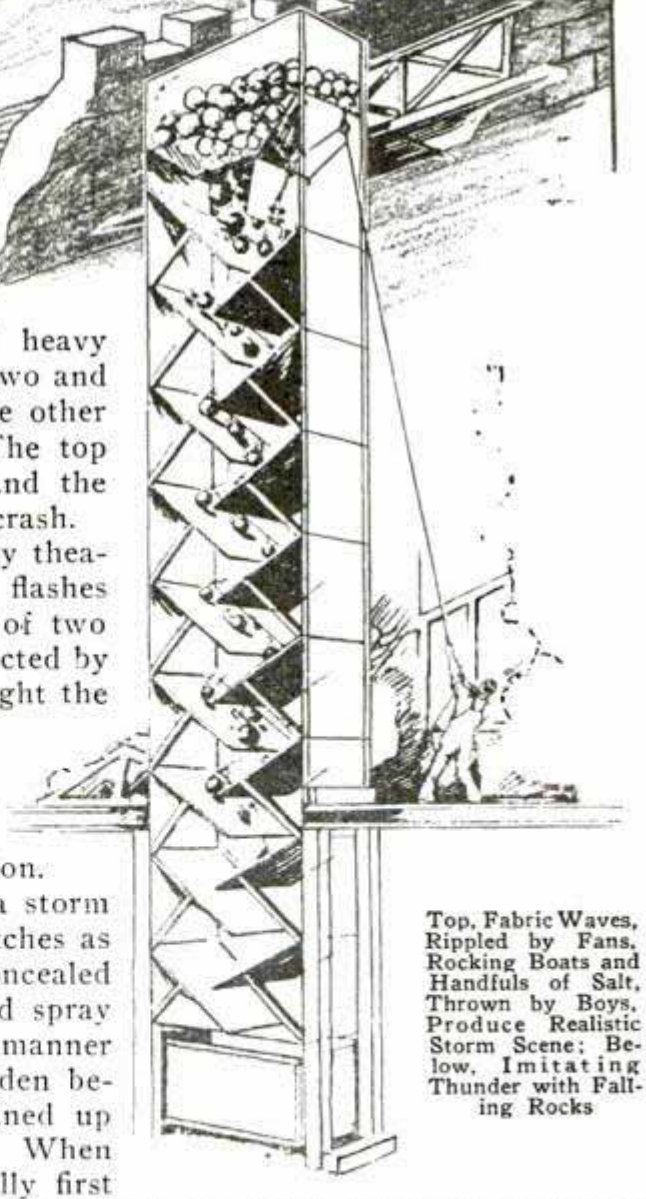
chalk is placed in the water to give it a light, foamy effect when the lights are played upon it.

At least four different kinds of thunder can be imitated on the stage, ranging from the sudden crash to the long roll. The sharp crash is effectively made by shaking a big sheet of iron hanging by ropes. The rolling sound is made on a square drum beaten with sticks that are propelled by electricity. On top of the drum are a number of small balls. The sticks can be regulated as to speed, giving the effect of thunder in the distance, gradually approaching. One of the loudest thunder machines is a tall wooden chute reaching several floors above the stage and down into the basement. Wooden slabs are set at angles in the box, and at the top are placed a quantity of stones of different sizes. When a trip is pulled, these crash down through the box, hitting the partitions and increasing the din as they descend. This noise effectively duplicates that of falling buildings and is a splendid imitation of a long thunder crash. Another loud thunder



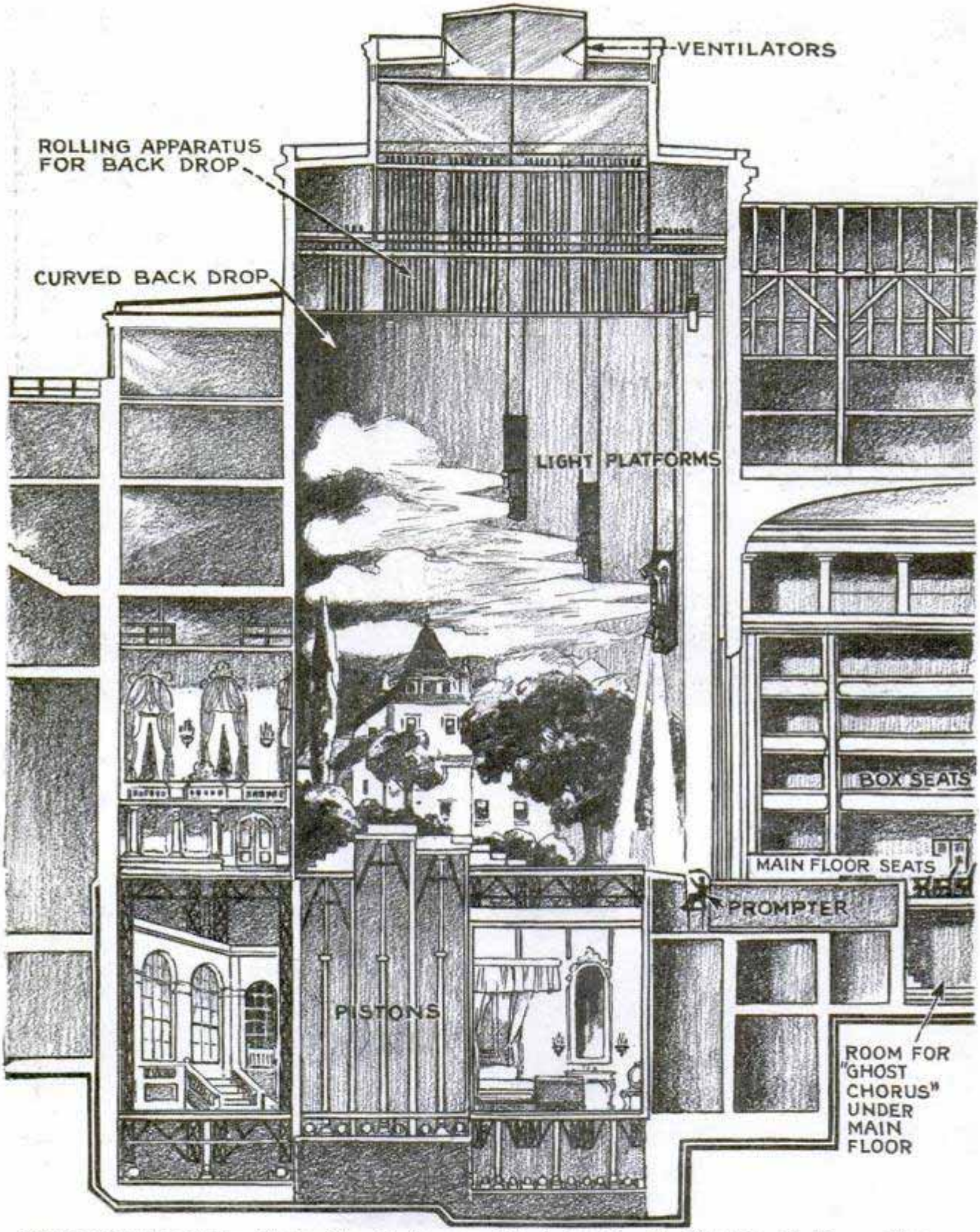
maker consists of a number of pieces of heavy wooden planking, about two feet wide and two and one-half feet long, suspended one above the other by small ropes attached to the corners. The top is suddenly cut loose by pulling a rope and the boards come clattering down with a sharp crash.

Before fire restrictions were rigid in many theaters, a common way to produce lightning flashes was to make brilliant arcs from the ends of two live wires. A man stood in the wings, protected by dark glasses and insulated gloves, and brought the wires together at the proper moment. This practice has been forbidden in many playhouses and effective flasher boxes have been introduced. They give the same bright "lightning" simply by pressing a button.



Top, Fabric Waves, Rippled by Fans, Rocking Boats and Handfuls of Salt, Thrown by Boys, Produce Realistic Storm Scene; Below, Imitating Thunder with Falling Rocks

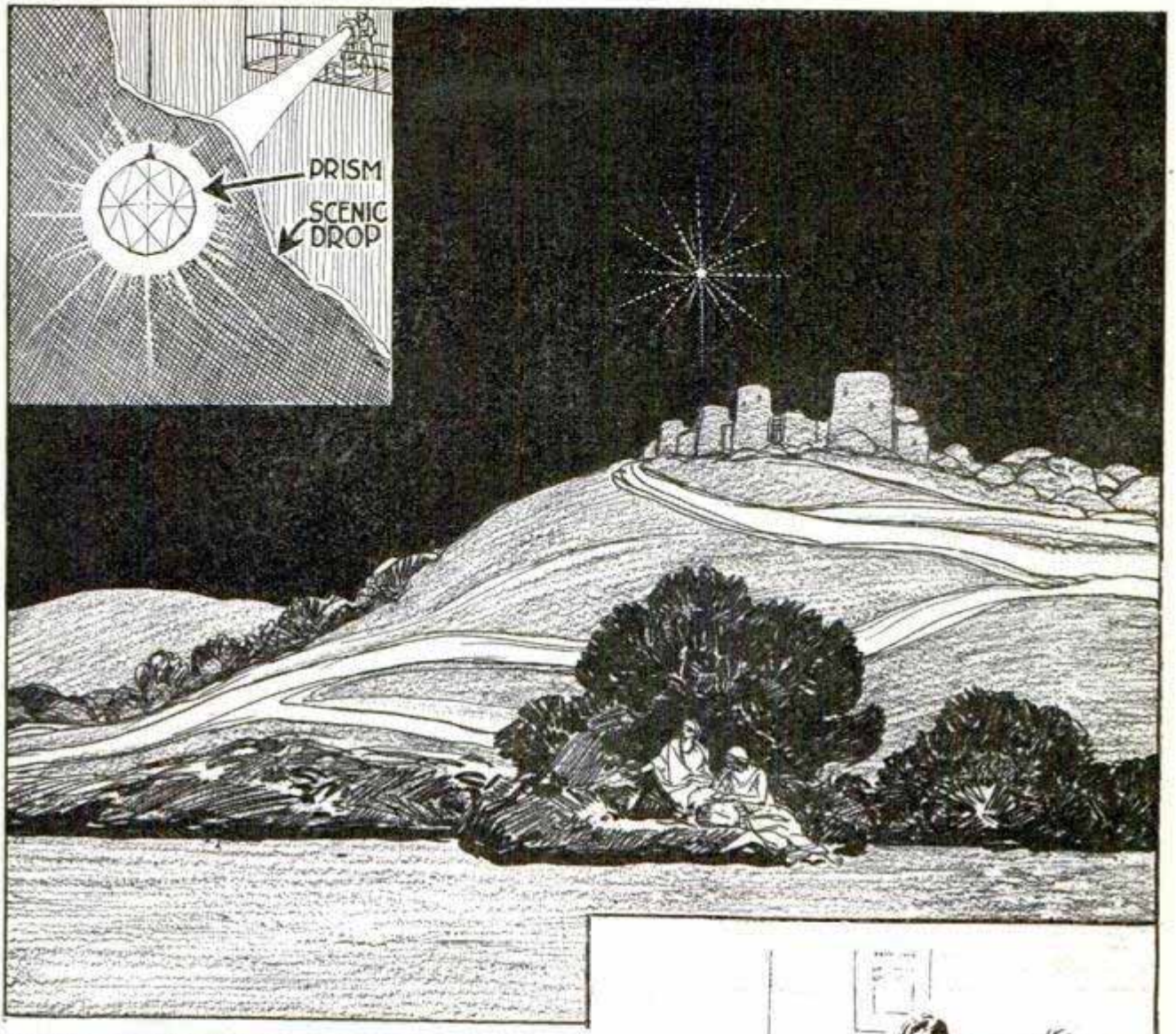
One of the high lights in "Othello" is a storm scene at the opening. A boat rocks and pitches as it crosses a sea of billowing cloth. Men concealed under the craft give it the movements, and spray from the waves is reproduced in a realistic manner by handfuls of salt thrown up by boys hidden beneath the setting. The salt is easily cleaned up and sparkles in the light of the lamps. When scenes like this are built, they are usually first worked out in miniature, and numerous rehearsals with the finished set are necessary so that all movements will be done in proper agreement and the lighting effects pro-



Sectional Drawing of New Theater Stage in Germany; Whole Sets Can Be Lifted into Position on Pistons for Quick Changes of Scenery and Many Novel Effects Obtained

duced at the right time. During these trials, the technical director and chief electrician usually sit in the audience and issue orders through a special telephone set to workers on the stage, who wear headphones.

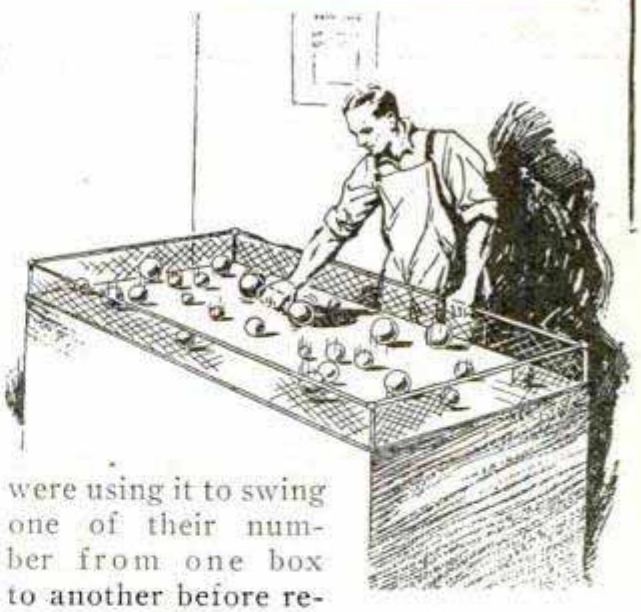
Opera has no monopoly on scenic effects, for special "trick" sets are needed for scores of productions every year. Often the success or failure of a show depends largely upon its mechanical equipment, for the plot may hinge on the accurate working of some piece of stage scenery. Producers testify that audiences



Beautiful Sparkling Star Made by Light Directed on Glass Prism, and Another Thunder Machine; Balls Are Shaken on Drum by Sticks Within

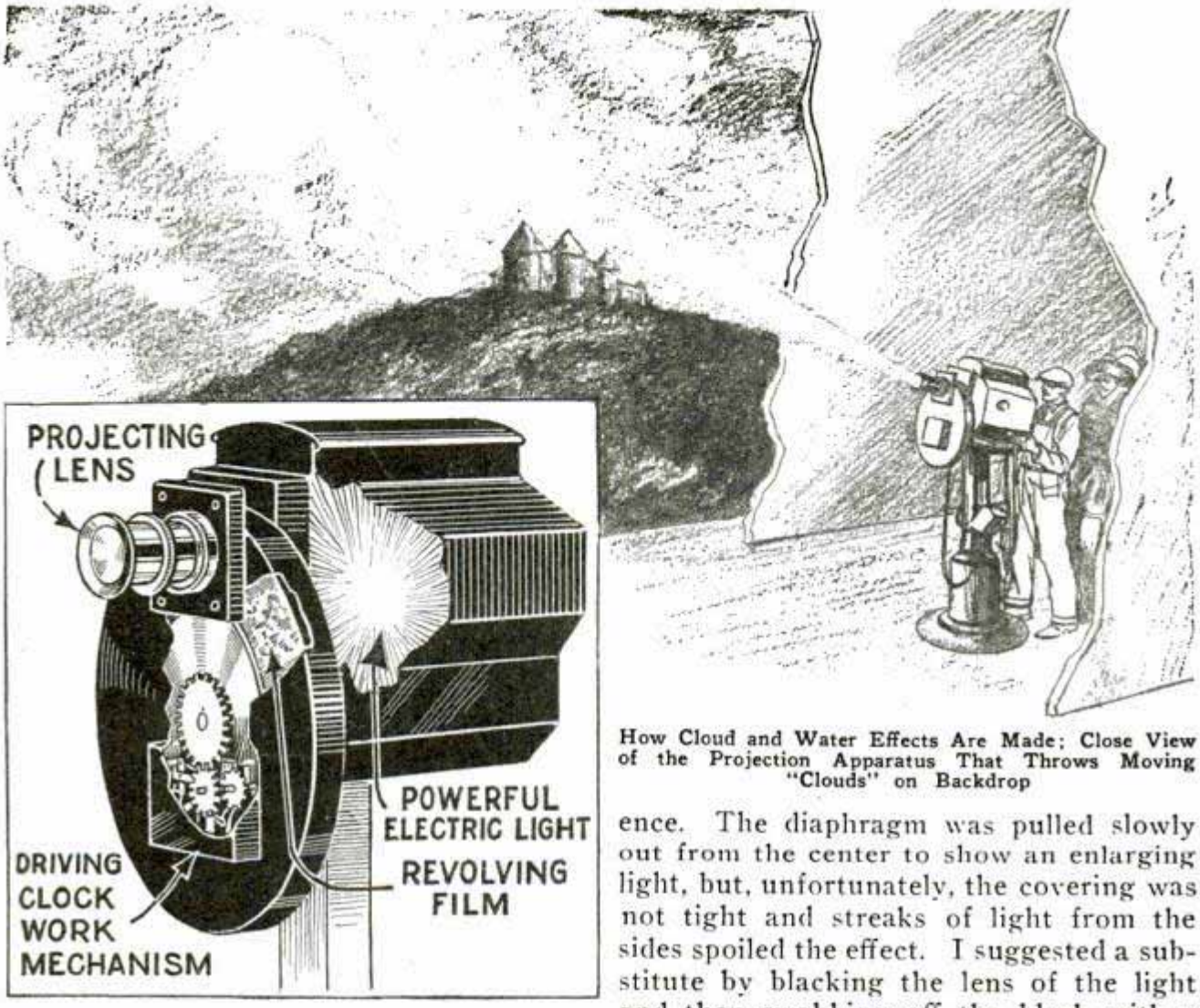
many times react more favorably to a simple and relatively inexpensive surprise act, involving a trick set, than they do to an elaborate number without this appeal. Inventors of stage devices are often called upon for aid in putting life into a show that seems headed for failure, and as "play doctors" they earn recognition as consulting specialists to the owner and producer of the play.

Esten Burleigh Beeler is the inventor of the "flying balloon," popular a few years ago. It was worked by a derrick backstage and carried an actor in a basket far over the heads of the audience, then drew the balloon back and disappeared. The idea for this act was conceived in watching a group of stage hands playing with a derrick that had been used as part of a quarry scene in another show. They



were using it to swing one of their number from one box to another before rehearsal. This novelty proved such a popular success that it was playing in seventeen theaters at one time.

Soapsuds and a rubber sponge gave Beeler another inspiration. He was toying with a sponge while bathing one day. The articles were new then and the chains of bubbles that oozed out when the rubber was squeezed soon filled the tub and



How Cloud and Water Effects Are Made; Close View of the Projection Apparatus That Throws Moving "Clouds" on Backdrop

poured over the sides. The sight gave the idea for a stage waterfall of bubbles. A series of fans were arranged to produce bubbles from separate tanks, blowing 3,000,000 bubbles a second to form a realistic cataract. The act recently brought $1,000 a week from a vaudeville circuit and the apparatus was also adapted to demonstrate the quality of different kinds of soaps.

Mr. Beeler has been a show doctor and inventor of stage sets for more than thirty years. Often the simplest tricks are the most effective, he says, and the most important moments of a show are the entrances and exits. "Years ago, I was a general errand boy and helper for Lincoln J. Carter," he related; "we were playing the old standby, 'The Heart of Chicago,' which featured, among other things, the approach of a locomotive. The illusion was produced by fitting a collapsing diaphragm over a headlight to represent the movement of the engine toward the audience. The diaphragm was pulled slowly out from the center to show an enlarging light, but, unfortunately, the covering was not tight and streaks of light from the sides spoiled the effect. I suggested a substitute by blacking the lens of the light and then swabbing off the black with a cotton-covered stick. I stood to one side where I could not be seen and worked the stick rapidly, beginning at the center and wiping outward. This gave the effect desired."

In recent times, the use of hydraulic and electrically lifted stages and parts of stages has widened the possibilities of scenic display and quick changes. In a German theater, whole settings can be arranged on separate stages dropped or raised above the main platform and then quickly swung into place when wanted, saving long delays.

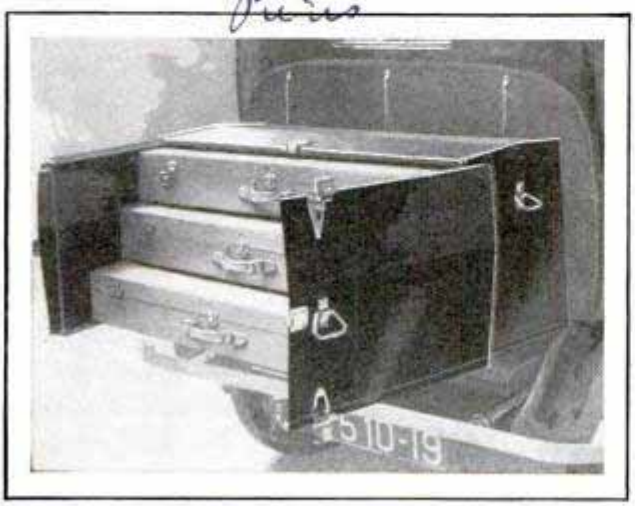
HUGE OBSERVATORY IS BUILT TO BE TAKEN DOWN

Designed so that it can be taken apart and returned to the United States at some future date, a big astronomical observatory recently was completed by the University of Michigan on a flat hilltop just outside of Bloemfontein, Orange Free

State. The fifty-six-foot dome, weighing fifty tons, was fabricated in Pittsburgh, assembled there for inspection, then taken down, shipped to South Africa and re-erected. It is built unusually light, as observatory domes go, to save shipping charges, and to make possible its eventual removal to another site, the entire structure is bolted together, instead of being riveted. There are more than 20,000 bolts in the structure, 9,000 being used to attach the galvanized iron roof. The dome houses a twenty-seven-inch refracting telescope, the largest in the southern hemisphere and the largest ever sent on a temporary expedition. The telescope was planned by the late Prof. W. J. Hussey to be used to study double stars in the southern hemisphere, and after his death, Robert P. Lamont, of Chicago, who had financed the building of the instrument, permitted the university to carry out Dr. Hussey's plans. Dr. R. A. Rossiter and two assistants, Messrs. Jessup and Donner, all of Michigan, are to be in charge. The new observatory has an international flavor, for, besides being an American institution erected on British soil, the actual building was carried out by a Swedish foreman and a crew of Kafir laborers.

AUTO TRUNK HAS SUITCASES THAT SERVE AS DRAWERS

For auto tourists, a luggage trunk, introduced in France, has three drawers, each of which is a separate suitcase and may be taken out and used as a special carrier. The trunk has generous capacity and can be closed tightly to keep out dust.



Auto Luggage Carrier Open, to Show the Suitcase Drawers That May Be Removed and Used Separately

© Keystone

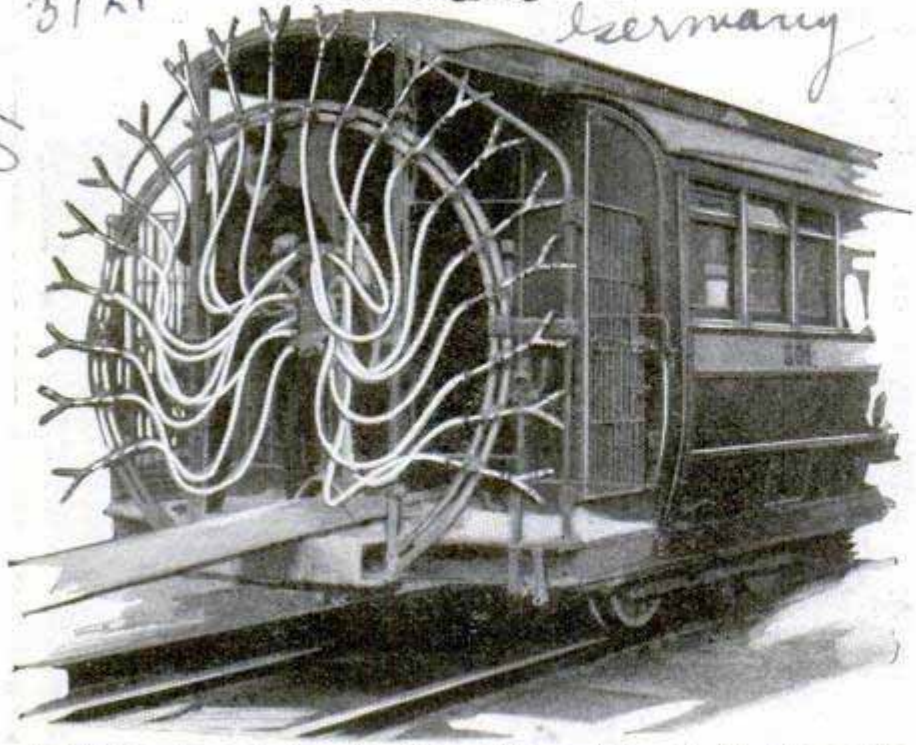
Miss Henry with Two of Her Inventions; She Has Obtained Forty-Three Patents

"LADY EDISON" INVENTOR HAS FORTY-THREE PATENTS

Because of her success in the field of invention, Miss Beulah Louise Henry, a descendant of Patrick Henry, has won the title of "Lady Edison." She holds forty-three patents on articles ranging from valves to dolls. Ideas come to her, she says, while visiting or dining with friends, and she usually visualizes the completed invention, working out the details later.

MOTOR FUEL TO CUT GAS PERIL SOUGHT FOR SAFER DRIVING

Especially suitable to high-compression motors, a fuel being developed by a research organization is regarded as a distinct improvement in that the amount of poisonous gas produced in combustion, is reduced to a minimum. Its performance is said to be due to a chemical process that changes the character of the fuel and to the influence of a new combustible compound. According to some investigators, the presence of so much poisonous gas in the air from automobiles is detrimental to the health and may partly explain many automobile accidents.



To Remove the Soot from the Sides and Top of Tunnels; the Cleaner Car with Its "Spiderweb" Adjusted for Work

"SPIDERWEB" CLEANS TUNNELS ON EUROPEAN RAILROADS

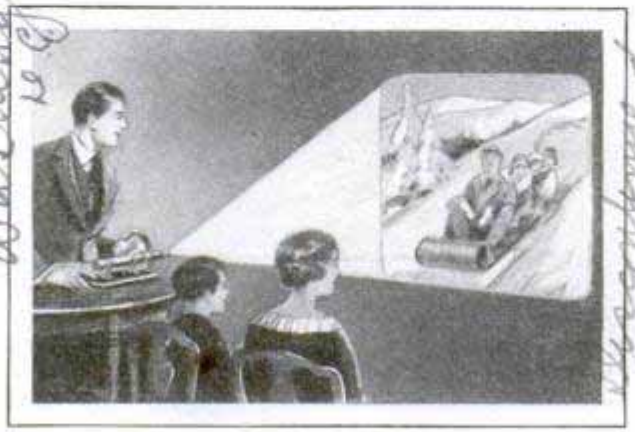
To keep the sides and the top of tunnels free from accumulations of smoke and soot, a curious web-shaped cleaner is used on some of the European railroads. It is adjusted at one end of a special car, its "arms" being so evenly distributed that all parts of the inner surface are reached as the cleaner passes through.

QUAKE INQUIRY TO PROTECT MISSISSIPPI VALLEY

An investigation of the possibility of future serious earthquakes in the Mississippi valley is proposed by Comm. Nicholas H. Heck, of the U. S. coast and geodetic survey. Addressing a scientific meeting recently, Comm. Heck said the slight earthquake felt near New Madrid, Mo., during the serious flood last year and the light shock in the same region on April 9, 1917, demonstrated the necessity of a thorough study of the Mississippi and Ohio valley earthquake zones on account of the danger to many populous cities of the middle west. New Madrid, he said, was the center of an earthquake or rather group of three earthquakes, which was ranged among the twenty greatest quakes of all history. The three occurred in December, 1811, and January and February, 1812, a vast area settling and another huge expanse rising as unconsolidated material in the earth readjusted itself. It was this series of quakes that produced the famous Reelfoot lake in northwestern Tennessee, not far from the Kentucky border. The Carnegie institution, of Washington, in co-operation with various state organizations and the federal government, has been investigating earthquake conditions in California, as is now proposed for the middle west.

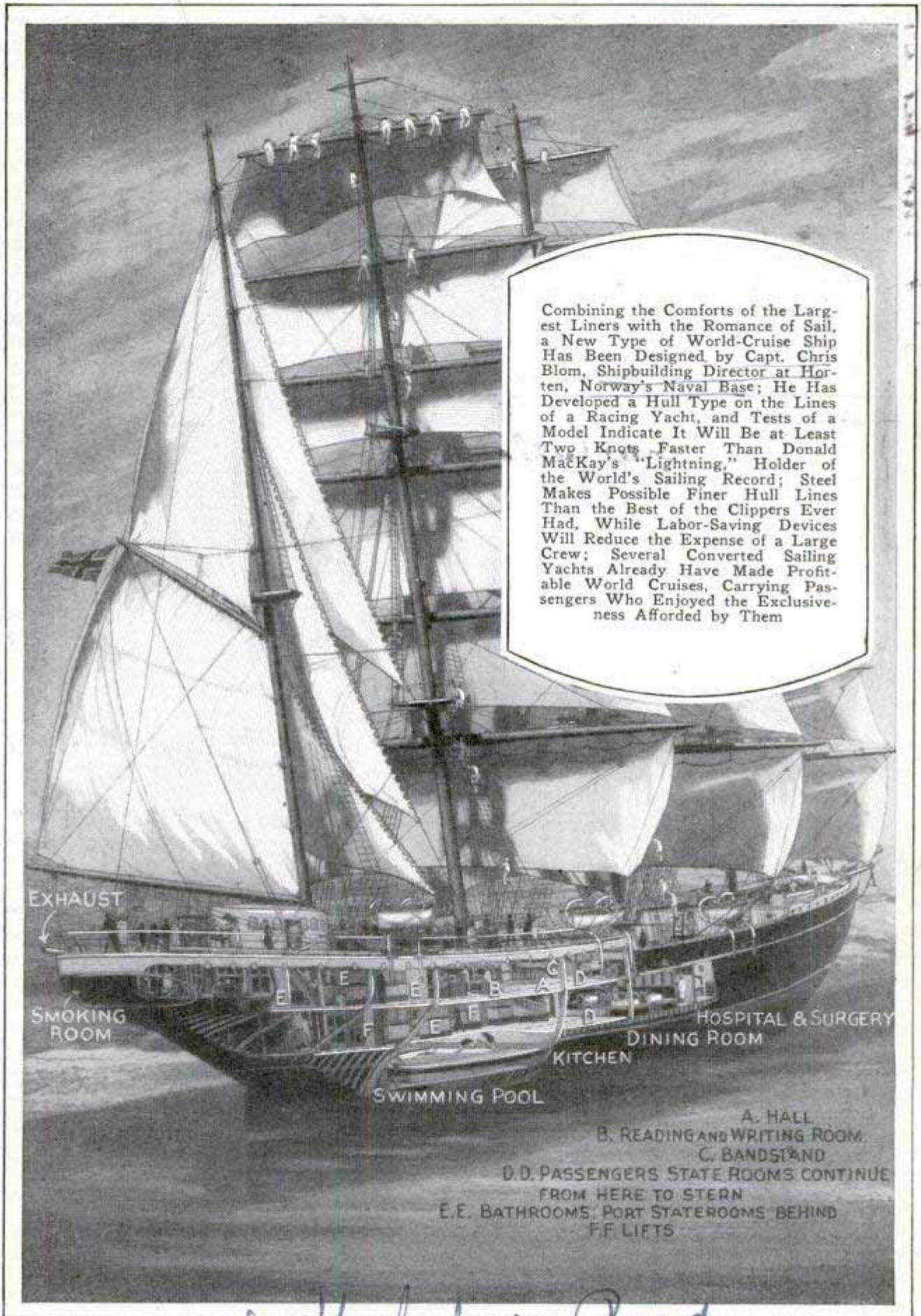
FLASHLIGHT TO PROJECT FILMS AIDS LECTURERS

As a substitute for glass stereopticon slides, film strips may now be shown on a screen from a flashlight projector, and this method has been made simpler still by a camera which enables the operator to make his own negative rolls. A length of the film which will give as many pictures as would thirty pounds of glass slides, weighs hardly an ounce. The rolls can be printed directly on positive film for use in the projector. With this outfit, travelers may have a convenient record of their trip to show their friends and the apparatus is especially serviceable to lecturers, etc.



Showing Screen Pictures from the Flashlight Projector; Film Is Used Instead of Glass, Saving Weight

SAILING LINER TO BRING BACK OCEAN'S THRILLS



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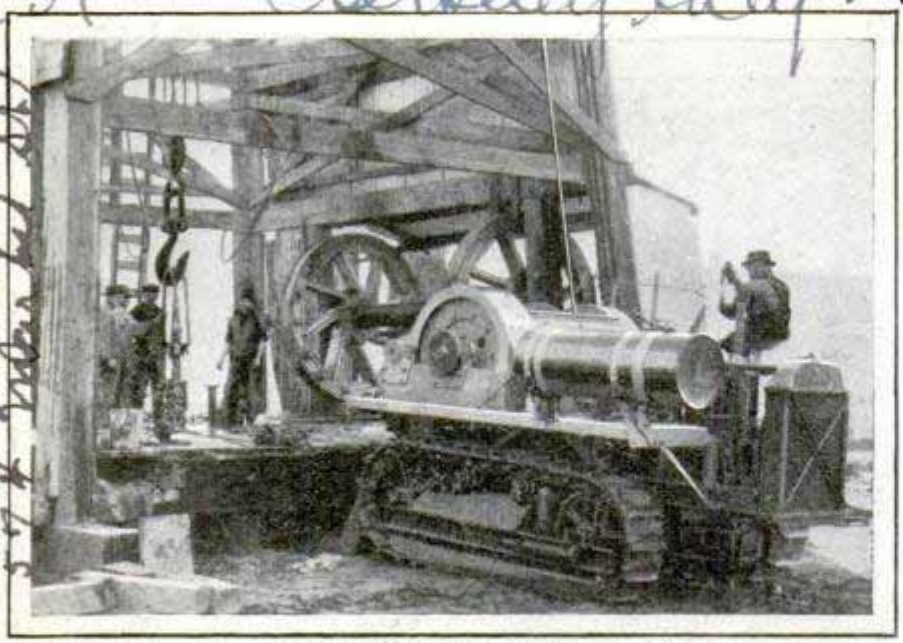


Hauling Tubing Out of Oil Well with Aid of Tractor; These Portable Power Plants Are Being Used Extensively

TRACTOR TO DRILL OIL WELL REDUCES COST

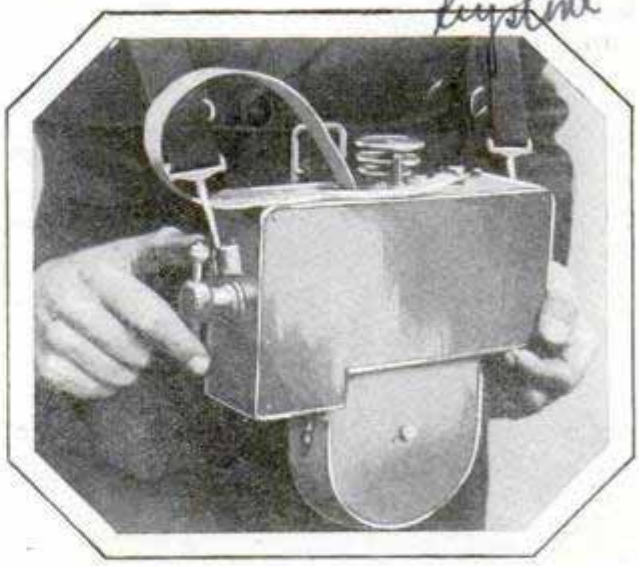
Portable power plants in the form of tractors with endless treads have been introduced in the Texas oil fields for drilling and other operations. On some wells they are said to have cut the cost nearly one third. In the accompanying photograph the tractor is removing 3,200 feet of tubing which had become filled with water. The work required only an hour and a half.

PRIZES FOR SAFER AIRPLANES TO STIMULATE FLYING

The Daniel Guggenheim foundation for the promotion of aeronautics has set aside $150,000 in prizes to be awarded for planes which most satisfactorily meet certain requirements for safety in the air. Following are the tests which aircraft must satisfy: The plane must maintain level and controlled flight at a speed not greater than thirty-five miles an hour and must be able to glide for three minutes with the power switched off and at a speed of not more than thirty-eight miles an hour. It must come to a stop within 100 feet of the spot where it first touches the ground in landing. A steady glide must be made over an obstruction thirty feet high and the plane must come to a stop within 300 feet of the base of the obstruction. It must clear a thirty-five-foot-high obstacle from a starting point 500 feet away. With power off, the ship must glide at an angle between eight and sixteen degrees at a speed of not more than forty-five miles an hour. In normal flight, at a speed of forty-five to 100 miles an hour, the pilot should be able to remove both hands from the controls for at least five minutes to demonstrate the ability of the plane to right itself from wind gusts. If the engine fails, the plane must assume a gently gliding position and make an easy landing. Three independent controls must be placed on the ship; it must be able to take off and land on a plot 500 feet square, surrounded by a twenty-five-foot obstruction, and must taxi against a strong wind.

TICKET MACHINE ON AUTO BUS EASES CONDUCTOR'S TASK

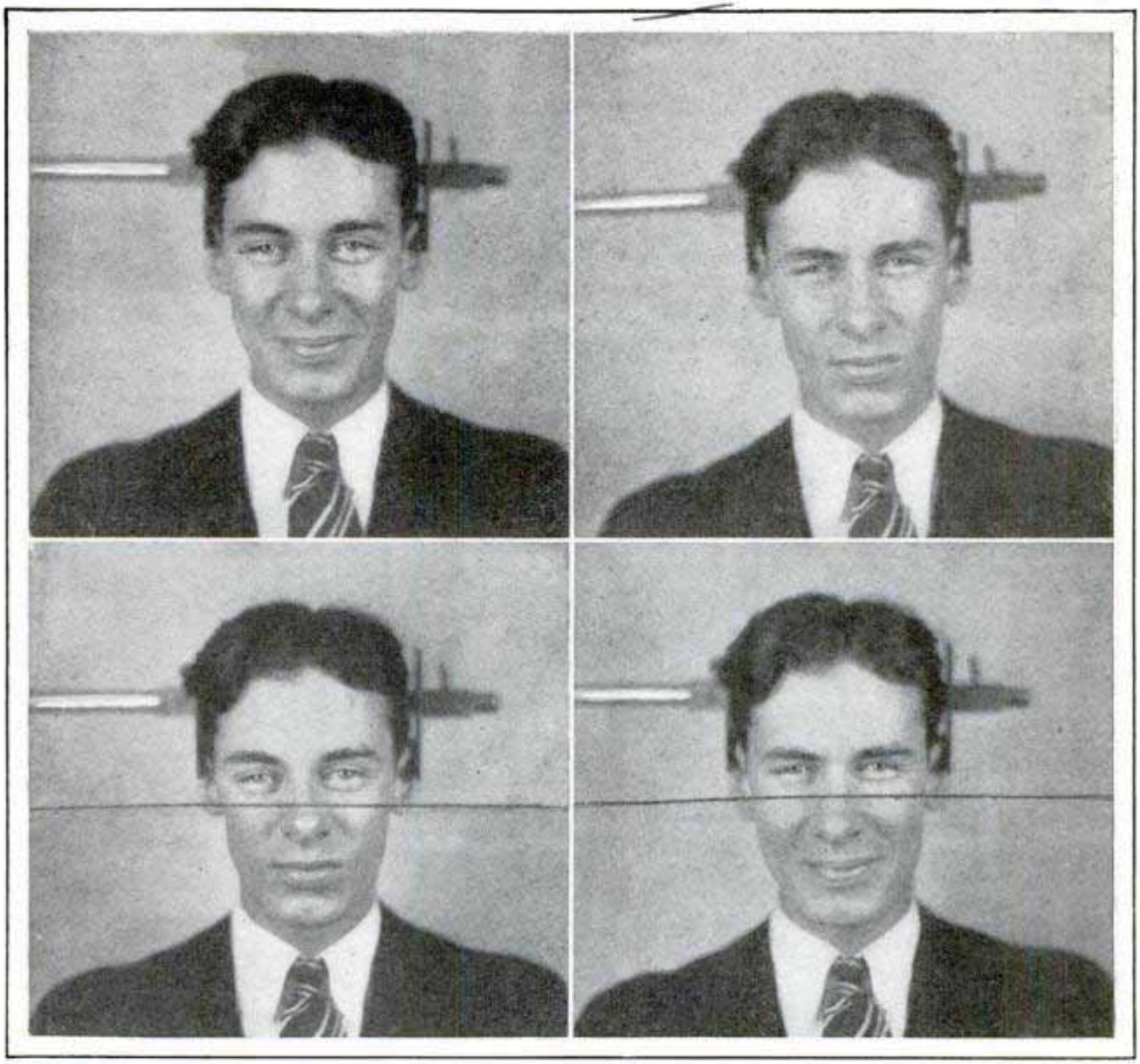
Six-wheeled auto busses, recently introduced in London, carry machines for quickly issuing tickets and transfers, saving the conductor the work of distributing them by the hand method. Each bus has a capacity of sixty-two passengers.



Ticket and Transfer Dispenser Used on London Auto Bus; It Saves Conductor Trouble of Handling Punch

The banana was once called the "apple of paradise" and "Adam's fig."

CHARACTER SECRET IN MOUTH, NOT THE EYES



Observe How the Mouth in the Lower Photos Gives the Dominant Expression; the Bottom Pictures Were Formed from Those Above by Transposing the Mouths

The mouth, not the eyes, is the chief factor which determines the facial expression, according to Dr. Knight Dunlap, of Johns Hopkins university. His findings have been made by taking a large number of photographs of men and women while they were registering different emotions, then making composite pictures by fitting the mouth of one mood to the eyes in another. In almost every instance, the expression of the mouth dominated, giving that mood to the entire face. For instance, a resentful expression of the lips seemed stronger than a cheerful look in the eyes. The photographs were shown to a psychology class of fifty, and four-fifths of the students identified the composites on the basis of the original photograph from which the mouth was taken. To induce the subjects to register the emotions desired, interesting methods were employed. A clever story was told to induce a smile, a pistol was unexpectedly discharged to cause alarm, and for disgust, the fumes of chemical compounds of an unpleasant nature were released near the sitter's nose. Grief was produced by putting the subject into a hypnotic state and then conveying the idea of personal bereavement. No trace of this emotion was left after the subject had been awakened from the hypnotic trance. According to the investigator, the eyeball itself cannot express emotion although the muscles and tissues around it may be moved in such a manner as to register moods.

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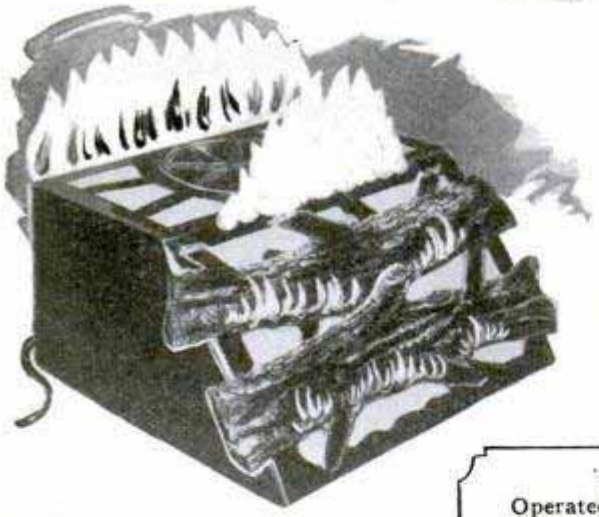
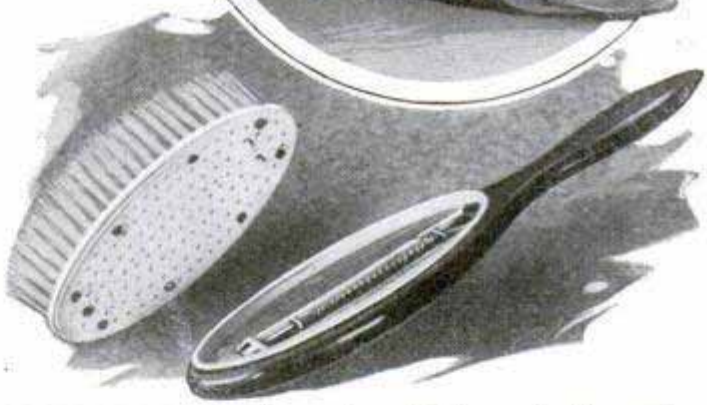
New Ways to Avoid

With This Covering, Furniture May Be Fumigated in the Home; Gases Are Drawn Off with Vacuum Cleaner

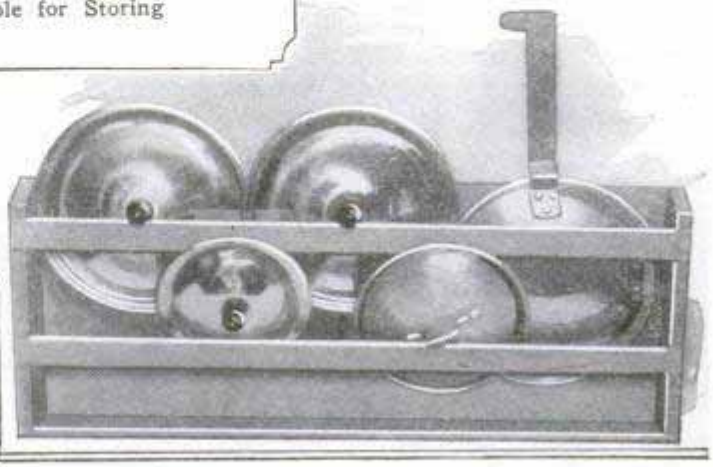


Operated from a Lighting Socket, an Imitation Log-Fire Set Produces Realistic Flickering Effects; It Is Collapsible for Storing



For Quick and Thorough Cleaning, the Bristles of This Hairbrush Are Mounted on Aluminum Plate Easily Detached from Handle

To Replace the Ordinary Cap, Spring Stopper Keeps Gas in Ginger Ale and Other Liquids



This Handy Rack in Which to Store Pan Covers Saves Time and Lightens Work by Eliminating Unnecessary Steps

Home Drudgery

For Opening Fruit Jars and Other Containers, This Efficient Wrench Is Adapted to Different Sizes and, on the End, Has a Bottle Opener; Wrench Is Constructed to Hold the Cover Firmly

Portable Electric Unit That Makes a Washing Machine Out of the Laundry Tub; the Cups Plunge Up and Down to Remove Dirt

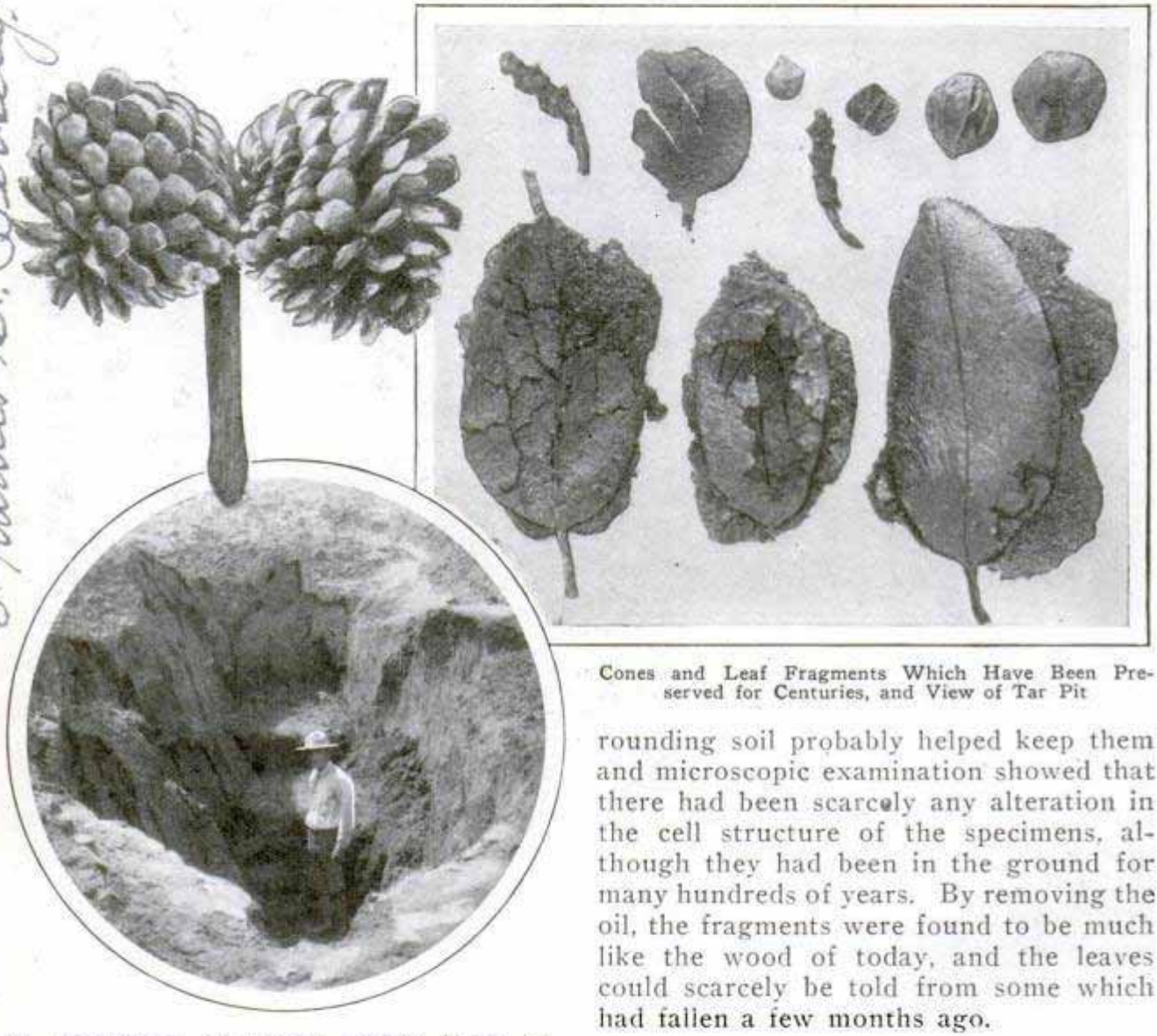
Combination Cutting Board and Bread Box Saves Extra Handling of the Loaf

This Strainer Lid May Also Be Used as an Extra Bottom, in Order to Prevent the Burning of Food

At Left, a Leak-Proof Cap That Makes a Shaker Out of a Milk Bottle; Right, Self-Timing Electric Egg Cooker Which Shuts Off the Current Automatically

WOOD KEPT THROUGH THE AGES IN NATURE'S LABORATORY

Scientists of the University of California have uncovered an apparent mystery in specimens of wood which have remained in excellent state of preservation for some 25,000 years. They were found thirty miles off the Pacific coast on Santa Cruz island and are remnants of an ancient fir forest. The fragments were not petrified nor had they been kept in oil or any substance so far as could be determined, but they were in good condition, as were cones, leaves and seeds. Apparently, they had been saturated with water at one time, hence the theory that they had been preserved in absolutely dry soil, had to be discarded. In the opinion of Prof. R. W. Chaney, who found them, some chemical substance, not now known, may have been formed about the specimens or have protected them from decay. In the natural tar pits near Los Angeles and Santa Barbara, remains of other ancient trees and plants also have been found. In this case, the oily nature of the surrounding soil probably helped keep them and microscopic examination showed that there had been scarcely any alteration in the cell structure of the specimens, although they had been in the ground for many hundreds of years. By removing the oil, the fragments were found to be much like the wood of today, and the leaves could scarcely be told from some which had fallen a few months ago.



Cones and Leaf Fragments Which Have Been Preserved for Centuries, and View of Tar Pit

SAW-BLADE HOLDER UTILIZES BROKEN PIECES

Hacksaw and other blades which may be broken in short lengths, can be further used in a rigid holder that takes blades not over half an inch wide. It has a convenient handle grip, keeps the blade from wabbling and buckling and is adapted to a wide variety of tasks.

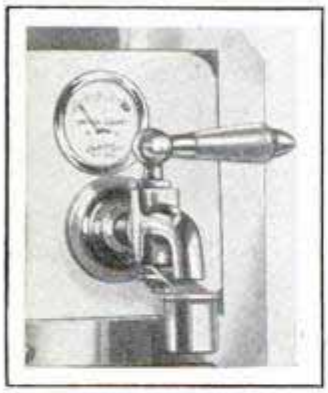
Saw Blade Fitted in Holder Which Is Adapted to the Further Use of Broken Pieces

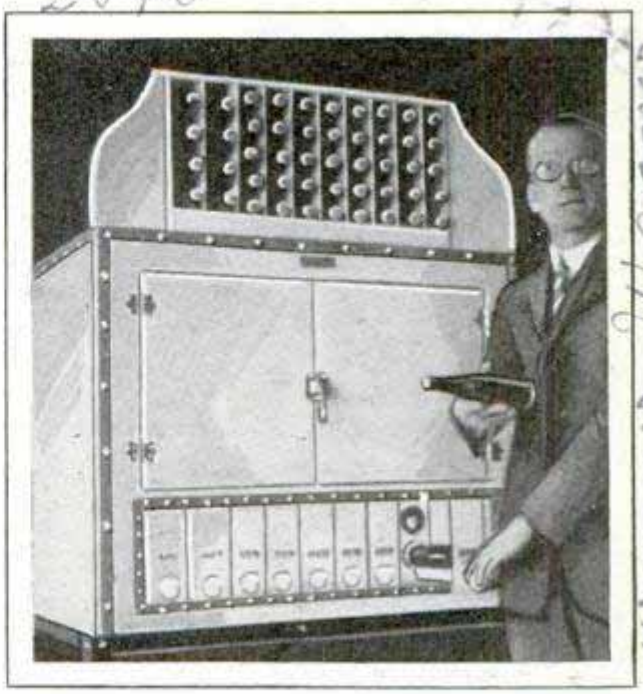
DESIGN LONG-RANGE BULLET WITH ELECTRIC SPARK

With the aid of an electric spark, army ordnance experts have designed a .30-caliber rifle bullet that has a range of 5,700 yards instead of 3,500 yards, the limit of the old shape. The new projectile has a long, pointed nose and a "boat-tail" rear end. Its form was decided upon after photographic studies of a moving bullet. The investigators at first were in a difficulty, for no camera could be found that would work quickly enough to show the bullet in flight without blurring. The missile traveled at a speed of 32,400 inches per second and even if the lens were opened but 1-32,400 of a second, the bullet would travel an inch in that period, and so appear blurred on the finished photograph. The problem was finally solved by employing an electric spark. Its instantaneous light "stopped" the bullet in its flight so that a clear picture resulted. The photographs showed the air "bow wave" and the "wake," or partial vacuum at the rear of the bullet, and from these data, one was devised that had less resistance to the air.

ELECTRIC STOVE COOKS MEAL AND HEATS WATER

Operated with current from the house-lighting system, an electric stove now on the market will cook an entire meal at once and will heat a small quantity of water at the same time. By means of the regulating device, the current can be shut off or turned on at any time so that the housewife may leave the kitchen, and the stove will attend to almost all the cooking after the food has been placed in it. With the range is furnished a special set of dishes for preparing the meal and practically any cooking operation can be performed on the unit, which is compact, easily cared for and operated at small cost. The photograph shows the gauge and faucet of the water compartment.





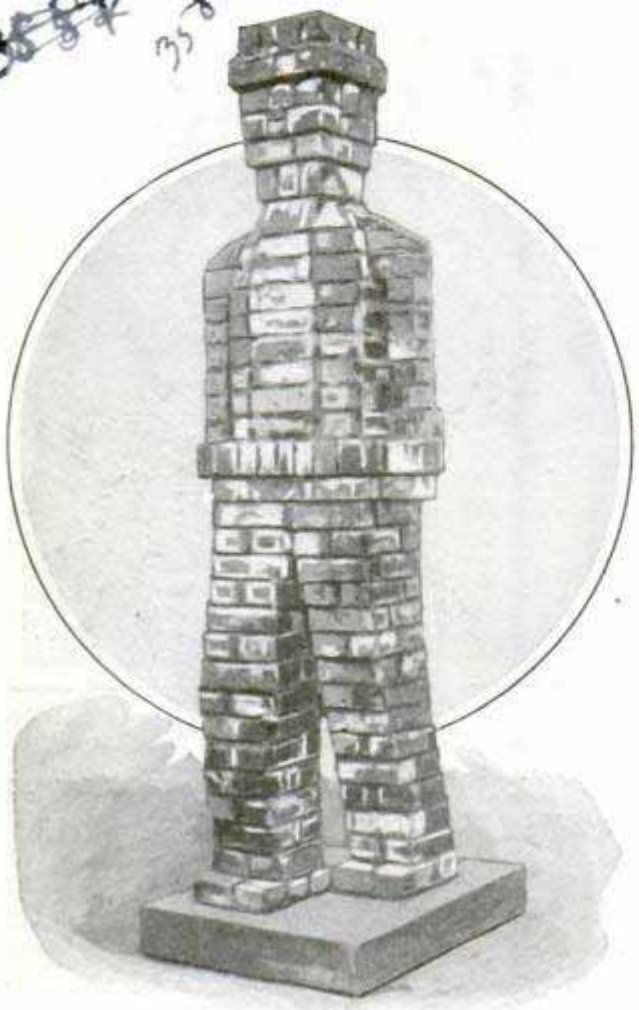
Cooler for Bottled Drinks Which Uses Ice or Refrigerating Coils; It Holds Large Supplies

BOTTLE COOLER AND DISPENSER SIMPLIFIES SERVING DRINKS

For cooling food and bottled beverages, a cabinet recently introduced has ten magazines from which the bottles are quickly dispensed. A feature of the unit is that it may be used with ice or with artificial refrigeration coils, the interchange being easily accomplished.

FRAME STRAIGHTENER FOR AUTO CUTS REPAIR COSTS

More than ninety per cent of all twisted or bent automobile frames can be straightened without removing the body or motor and usually without the application of heat, it is said, with a simple apparatus introduced to save the garage and repair man labor and to increase their profits. The outfit is of steel, weighs less than sixty pounds and can be adapted to any size of passenger-car, bus or truck frame. More than twenty tons' pressure can be exerted with the unit, which functions through clamps and is operated by pushing and pulling devices.

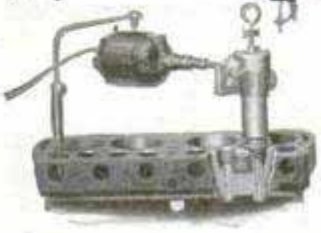


Advertising Figure Constructed of Brick, to Show the Decorative Possibilities of the Material

MMY MAN MADE OF BRICK ADVERTISES FACTORY

To attract the attention of the public to his product, an eastern brick manufacturer has constructed a dummy man of the material at a conspicuous point. The design illustrates the decorative possibilities of brick, was fashioned at little cost and requires no upkeep expense.

GRINDER FOR AUTO-VALVE SEAT SAVES HAND WORK



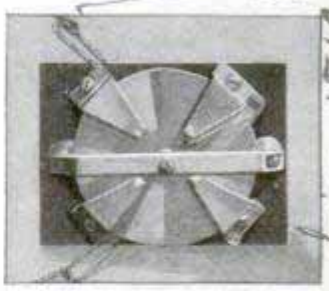
Economy and improved workmanship are claimed for a motor-driven grinder to recondition the automobile-valve seats. It is simple to use, the motor being attached to a swinging support inserted in a valve guide at either end of the block, and power is transmitted through a flexible shaft to the grinder head, which operates eccentrically, taking the high part of the seat first and removing but a few thousandths of an inch of the metal so that the valuable hardened surface is retained. A somewhat similar unit for grinding the face of the valves has also been introduced.

STEEL FOR PINS AND NEEDLES TOTALS MANY TONS YEARLY

Small articles account for two-fifths of the steel used in the manufacturing industries of the United States. Pins alone require steel at the rate of 1,400 tons a year, while 400 tons go to the making of needles. Scissors consume 500 tons and pens call for an allotment of 375 tons. Although belts are more widely worn, the making of suspender buckles calls for 250 tons of steel yearly and loose-leaf notebooks require 3,000 tons for the clasps and trimmings. The prevalence of bobbed hair has increased the demand for clippers, some 500,000 being turned out each year and consuming over sixty tons of steel.

MOTOR OPERATED BY RADIO OR STATIC FROM AIR

Resembling a spiderweb tuning coil, a tiny motor, designed by a Washington inventor, is run by connecting it to a radio antenna and ground after the set has been disconnected. It behaves differently in response to varying atmospheric conditions.



© Harris & Ewing

For instance, if the air is charged with electrical disturbances, the mechanism is speeded up, giving credence to the theory that static, in being harnessed in this manner, might become a blessing instead of a trouble. The inventor is now at work on a motor of larger power which he hopes to run by radio. Impetus to this line of endeavor has been given by the discovery of scientists that at any specified elevation above the earth, there exists a definite electrical potential between that level and the surface of the ground.

Easy Juggling Tricks

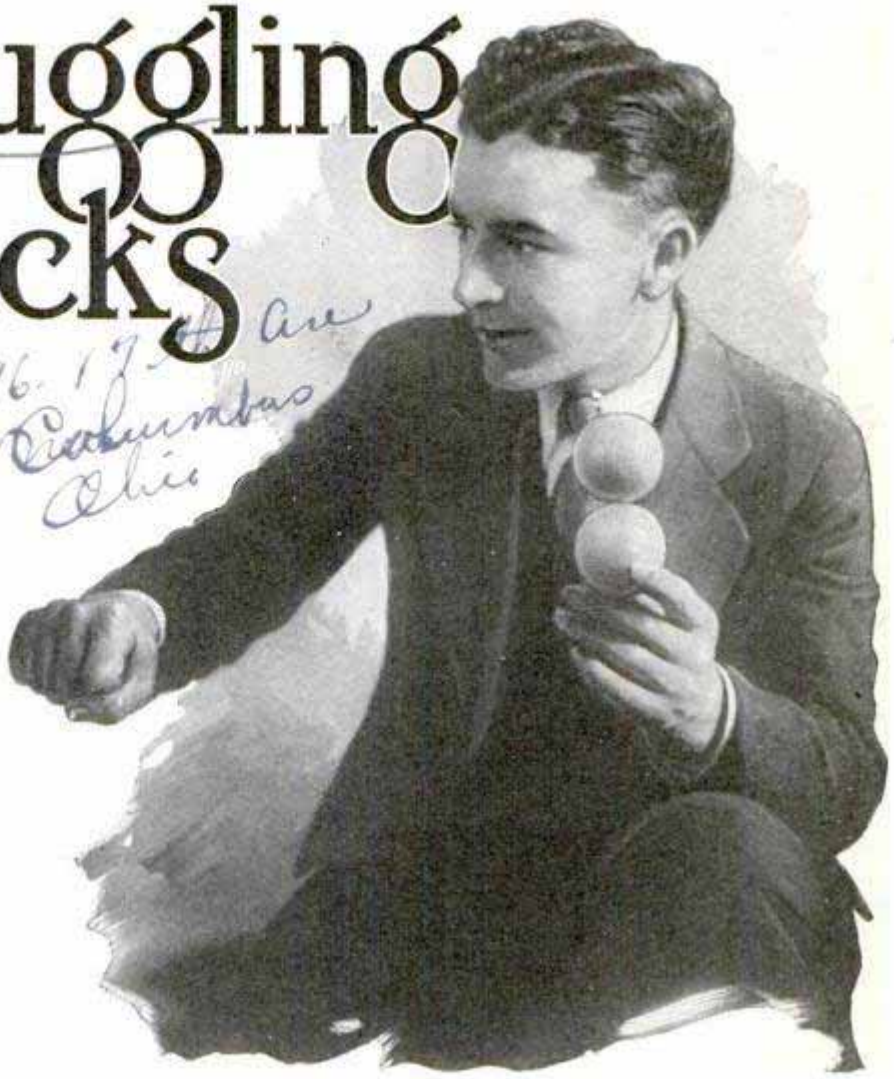
By SAM BROWN,

JUGGLING is perhaps the oldest form of entertaining known to the world, superseding even the venerable feats of black magic performed by ancient fakirs.

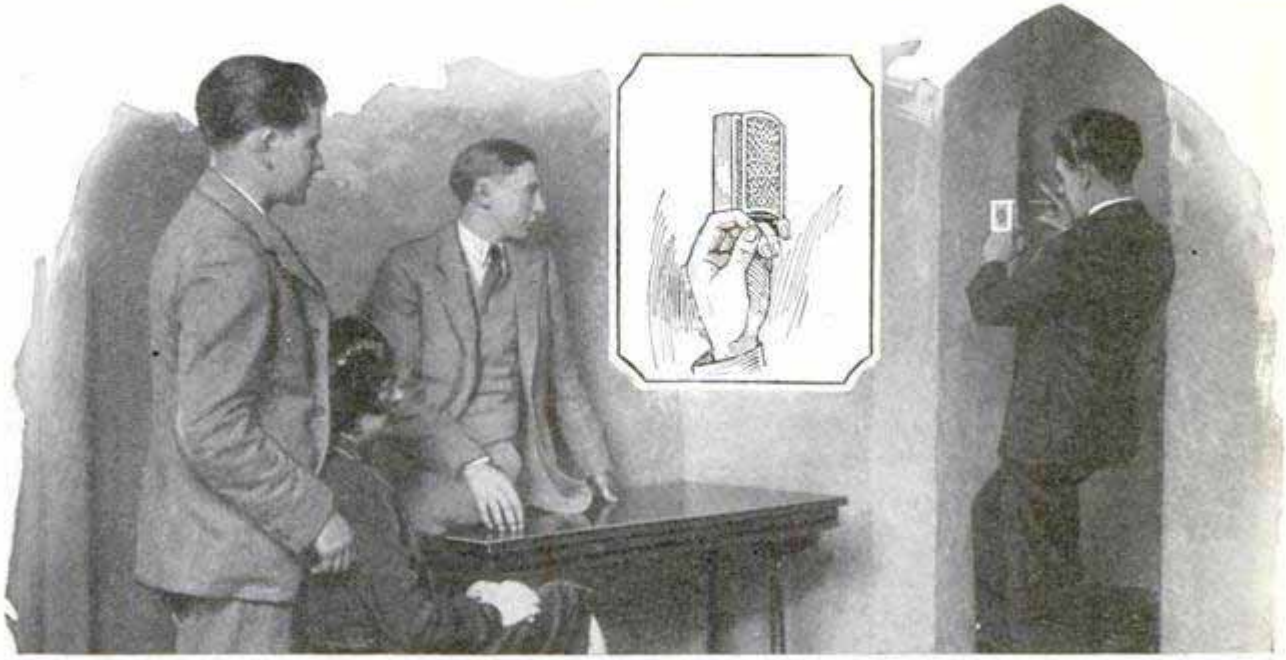
If your voice refuses to warble sweetly some barber-shop ballad and your funny stories fall flat, then you can still take a role in the whirl of social life by doing some little feat in juggling. Not obtrusively or with ostentation, but in the natural order of events.

Just listen:

Imagine you have a deck of cards in your hands, and that "stunts" are in order. What can you do that is entertaining and a little different? Well, why not show the audience the marvelous power you have over cards by balancing the entire deck on the knuckles of your left hand, as shown in



It Is an Easy Matter, if You Have a Small Piece of Beeswax, to Balance Two Billiard Balls in One Hand



Here Is a Simple Method of Juggling an Entire Pack of Cards Upright on the Knuckles of One Fist; the Inset Shows the Trick in Shifting the Last Card to Hold the Deck Against

the illustration. Sure, that's fine, but how do you do it? Simple! You merely slip the last card in the pack into the position shown, doing this under cover of the rest of the pack, and—lo!—your audience will be sitting back in amazement. Try it!

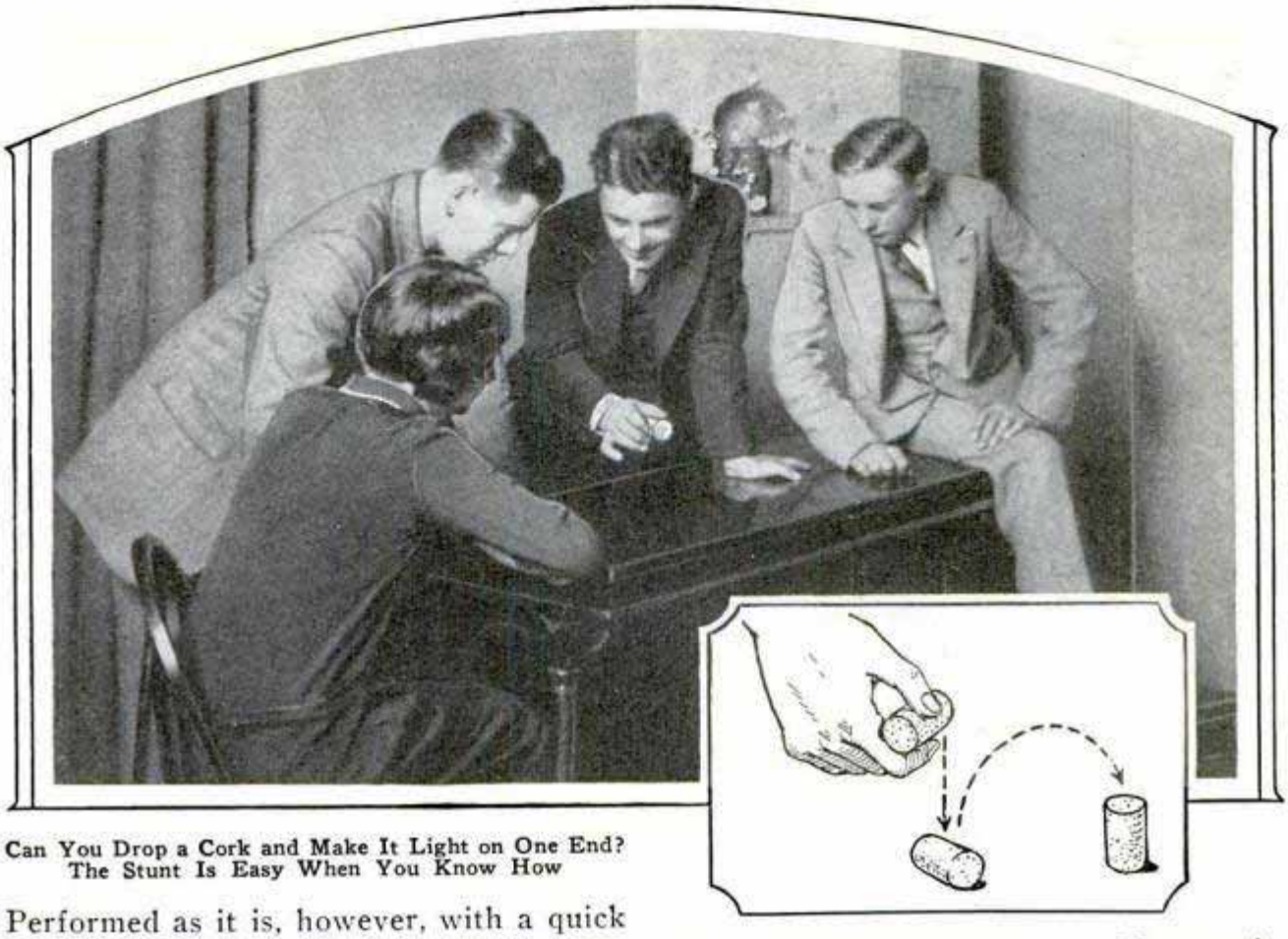
Again, when someone asks you for a match, light it for him in the manner shown. When the match is pulled out it comes away lighted, and your friend is somewhat surprised to find that this novel way of lighting a match leaves your hand perfectly free from burns of any kind.

Did you ever see the professional juggler balance two billiard balls, one on top of the other, and wonder how it was done? The professional usually does this with a set of ingeniously faked balls, but you can easily duplicate the effect by using a tiny piece of beeswax. This you have stuck on the thumb nail of your left hand at the beginning of the trick. It is a simple matter to roll one of the balls over your thumb nail, allowing the wax to adhere to the surface of the ball. If the other ball is balanced on the waxed one, using the wax as a base, you will find that a fairly steady hand is all that is necessary to turn the trick. The wax, which is quite invisible, can be wiped off later and the balls handed to the audience.

Everybody is more or less informed about the wonderful parchment of which our paper money is made, but not many have heard that it is so tough that it can break a match or even a light pencil when applied under proper conditions.

In doing this trick the performer has a spectator hold the match, as shown in the center picture on this page; one hand at each end. The performer takes the folded bill, as shown, and with a single blow cleanly parts the match. The secret is simple. As the performer's hand descends he extends the index finger, as shown, and it is this finger and not the bill that really breaks the match.

A Trick Way of Lighting a Match, Top, and, Center and Bottom, the Secret of Breaking Matches with Dollar Bills



Can You Drop a Cork and Make It Light on One End? The Stunt Is Easy When You Know How

Performed as it is, however, with a quick sweep of the hand, the movement is never detected and the illusion is perfect.

Prohibition rather put the long, untapered cork out of existence, but if you can secure a cork of this type you have the full equipment for an interesting little experiment in juggling. Give the cork to a spectator and request him to drop it on the table so that it will stand on end. The average person tries to do the trick by dropping the cork very lightly on end, but due to the great elasticity of cork, this manner of dropping only causes it to rebound and fall on its side.

And now for the secret, which is quite simple. The cork is dropped from a height of about four inches. Now, if a cork dropped on its end rebounds and falls on its side, then the same cork dropped on its side will rebound and fall on its—. "Right you are!" as the Englishman would say. That's just exactly how you do it.

Another stunt worked on the same principle as the preceding one is the "Dropped Card" experiment. This effect is usually presented in the guise of a game of skill, the performer betting that he can drop more cards on a magazine which is placed on the floor than any other person present. The spectators try first. Here again, the average person will fail, simply because he drops the cards edge down, as shown on the next page, and cards precipitated in this manner will invariably sail away from the magazine. You can make a perfect score by dropping the cards face down, as also shown.

One with a handkerchief? Certainly! You see an aspiring young juggler commanding a frail, fluffy handkerchief to stand erect in his right hand. Of course, the audience does not see the fine piece of thin wire which is wrapped up and attached to one corner of the "hanky" at the beginning of the experiment. When the performer wishes to show the effect, he need only bring forth the magic silk, straighten the wire, pose dramatically—and there you are!

Another effect with a handkerchief, and one which is a little masterpiece all in itself, is the "Serpent Silk." Learn this one.

Remarking that the skin of a certain snake which lived in China ninety-nine years ago still retains the power of life when properly handled, the performer takes a dark silk handkerchief from his pocket. "This is the snake!" He next ties

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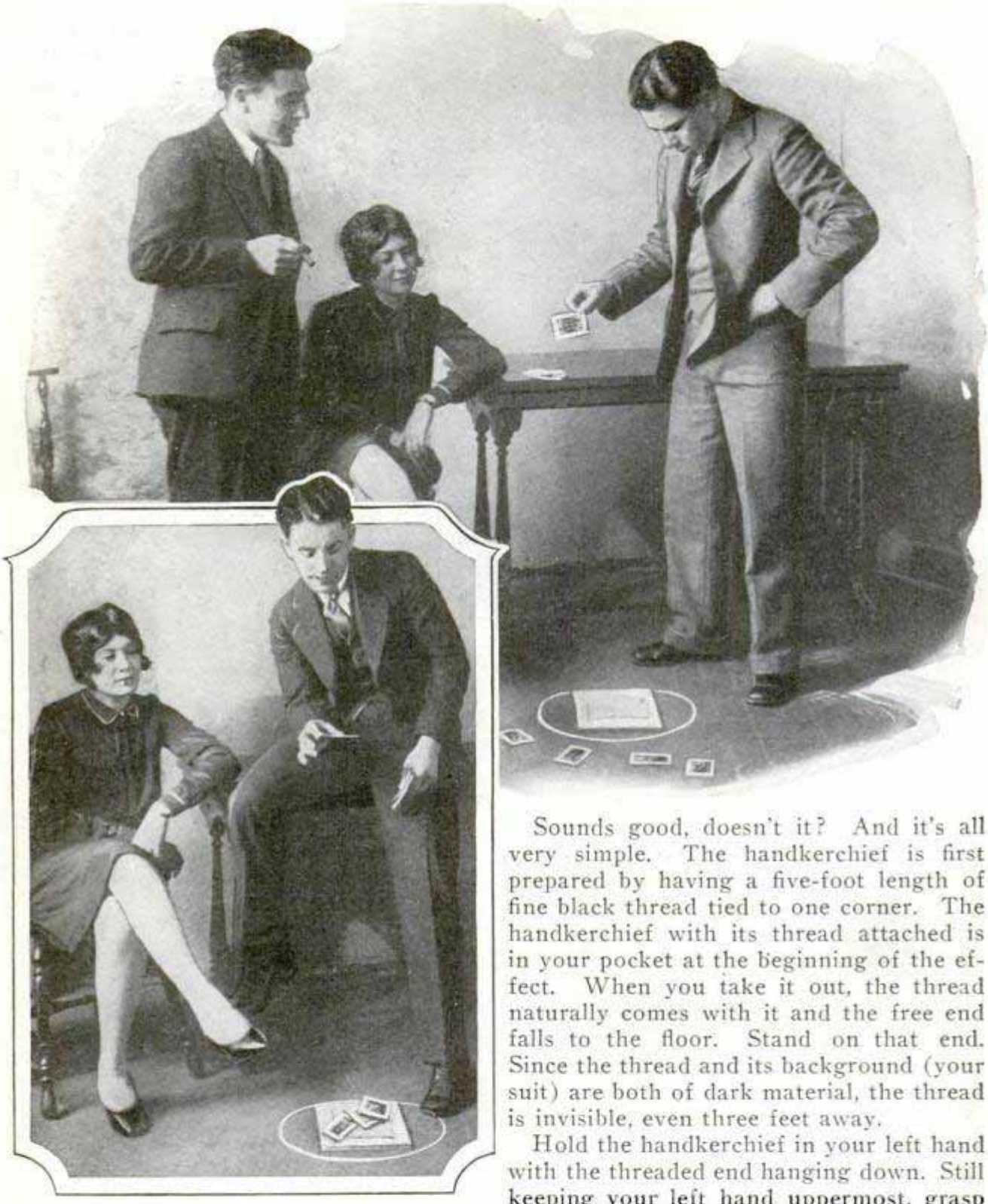


The Wrong and the Right Way of Dropping Playing Cards So They Will Fall within a Small Circle

a knot in the center of the handkerchief. The knot finished, he makes a few gentle swishes to imitate the actions of a snake, holding the silk in his left hand. Presently the lowermost end of the handkerchief is seen to curl upward, finally emerging through the knot and thus untying itself entirely.

Sounds good, doesn't it? And it's all very simple. The handkerchief is first prepared by having a five-foot length of fine black thread tied to one corner. The handkerchief with its thread attached is in your pocket at the beginning of the effect. When you take it out, the thread naturally comes with it and the free end falls to the floor. Stand on that end. Since the thread and its background (your suit) are both of dark material, the thread is invisible, even three feet away.

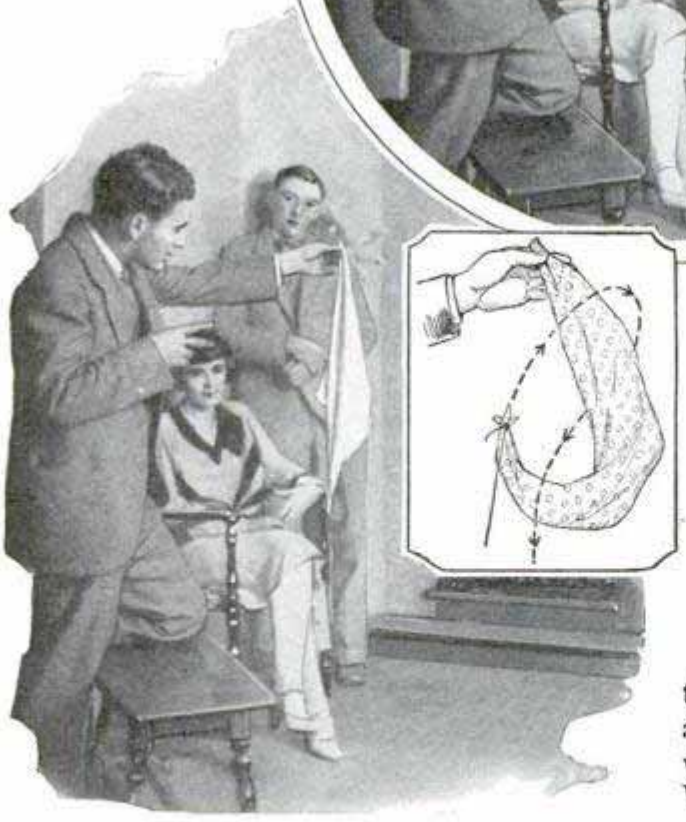
Hold the handkerchief in your left hand with the threaded end hanging down. Still keeping your left hand uppermost, grasp the threaded end in your right hand and tie an ordinary single knot as shown in the sketch, taking the thread through with the knot as shown by the dotted line.

Do not pull the knot too tight, but let it hang loosely in the center of the handkerchief. Now, if you will move your left hand (holding the handkerchief) in an upward direction, either fast or slow, the snake will untie itself. Honest!

Cigarets and soft felt hats are both quite common properties, but the sight of a cigaret balancing its frail white length upright on a felt hat is something quite unusual.

The "nigger in the woodpile" in this effect is an ordinary straight pin. This you have stuck in the lining of the hat previous to showing the effect. When you wish to perform, remove the pin from the lining, jab it through the crown of the hat and up into the cigaret which will then stand erect in a manner quaintly mystifying.

Thread, pins and needles are the stand-by of the amateur juggler, along with a bit of beeswax. The things that can be done with their aid are often astounding. For example, the same thread used to operate the handkerchief snake will serve to make the snake appear as if by magic out of the air.

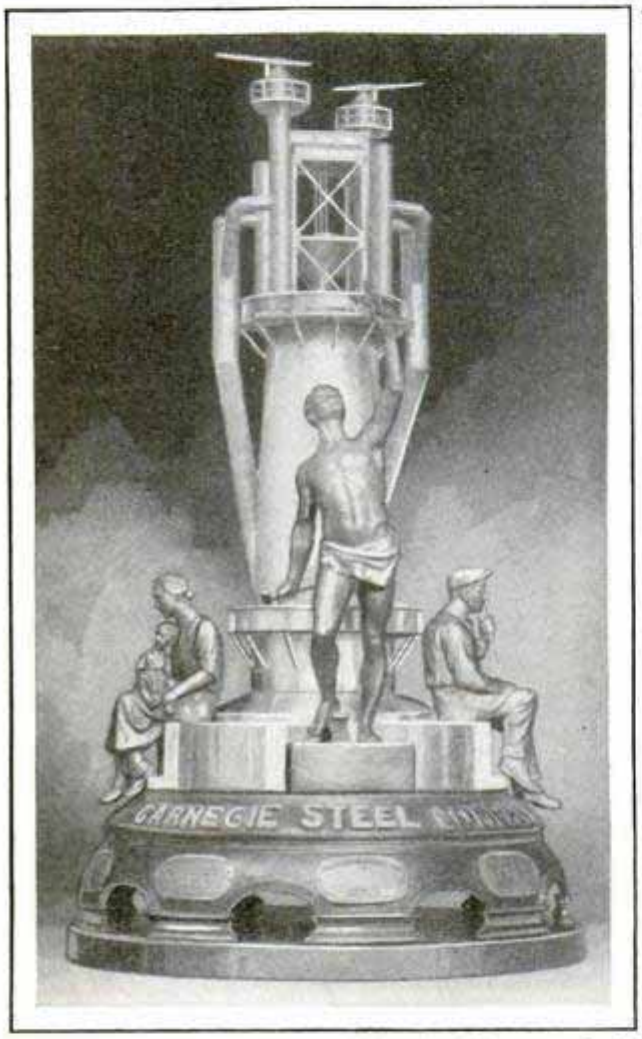


The Handkerchief Snake Comes to Life, and, Top, an Easy Way of Making a Handkerchief Stand Up

At one moment the performer's hand is empty, and the next instant he has snatched a large silk handkerchief out of space and is ready to stage the snake stunt.

All that is necessary is to lay the handkerchief down, after tying the thread to one corner, lay the length of the thread across the cloth, fold the corners in until you have a bundle three or four inches wide and the length of the diagonal of the handkerchief. Now start rolling, beginning at the corner at which the thread is attached. When you have rolled the handkerchief up in a small cylinder the rest of the thread, three or four feet long, is left dangling from the package. Tie a large loop in the end, insert the roll under the coat lapel, and allow the thread to hang down, as it will be invisible against one's dark suit. When you want to produce the handkerchief, slip the thumb of the left hand through the loop in the thread, and get

the thumb of the right hand behind the cord. Now extend the right hand quickly out and upward into the air, at the same time jerking the left hand down to the side. The thread, sliding between the right thumb and forefinger, will jerk the handkerchief out from under the lapel, unroll it, and, so quickly the eye cannot see from where it appeared, a fully opened handkerchief appears in the right hand.



Blast Furnace Modeled to Scale in Silver as Steel-Mill Safety Trophy

SILVER BLAST FURNACE GIVEN AS SAFETY TROPHY

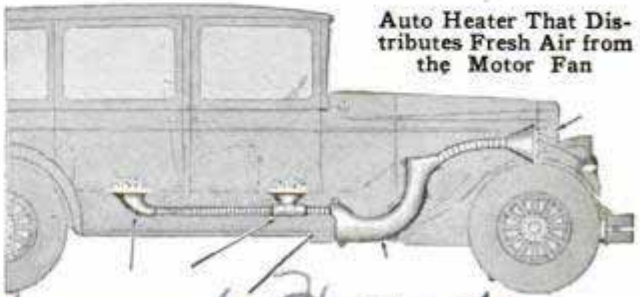
A miniature blast furnace, executed in sterling silver and correct to every minute detail, is the central figure of the safety trophy for the plants of the Carnegie steel corporation. Against the background of the furnace rises a bronze figure of Vulcan, the patron god of metal workers, and on either side are seated a steel worker and his wife and baby. The trophy is mounted on a bronze plinth carrying nine plates for the names of winning plants, and, between two plates bearing the words "Safety Trophy," a tenth plate for the name of the final winner, in whose custody the trophy will remain. Since the Carnegie company started its safety work, in 1911, there has been a reduction of eighty-six per cent in accidents involving loss of time.

SALT IN PLANE MOTOR'S VALVES AIDS LINDY'S SUCCESS

Salted valves on Col. Charles Lindbergh's plane, "The Spirit of St. Louis," were one of the secrets of his success, according to engineers. The salt was inside the stems, which were bored out, filled and sealed in the process of manufacture. The advantage of this arrangement, according to claims made for the units, was that the intense heat at the valve head was relieved somewhat by being distributed through the salt to the cooler stem, which was about twice the thickness of the average automobile valve stem.

AUTO HEATER GIVES FRESH AIR FROM MOTOR FAN

Supplies of fresh, warm air are said to be assured at all times from an automobile-heating installation now on the market. Circulation is maintained by the motor fan and fresh air is afforded whether the winter covering over the radiator is open or closed. The main heating unit is of cast aluminum which is placed about a joint-free section of the exhaust pipe, preventing the leakage of fumes into the warming system. The radiators are of aluminum and bronze and may be installed in the front, rear or both compartments. Absence of moving parts simplifies the operation of the heater which is controlled by shutters of the butterfly type.



Auto Heater That Distributes Fresh Air from the Motor Fan

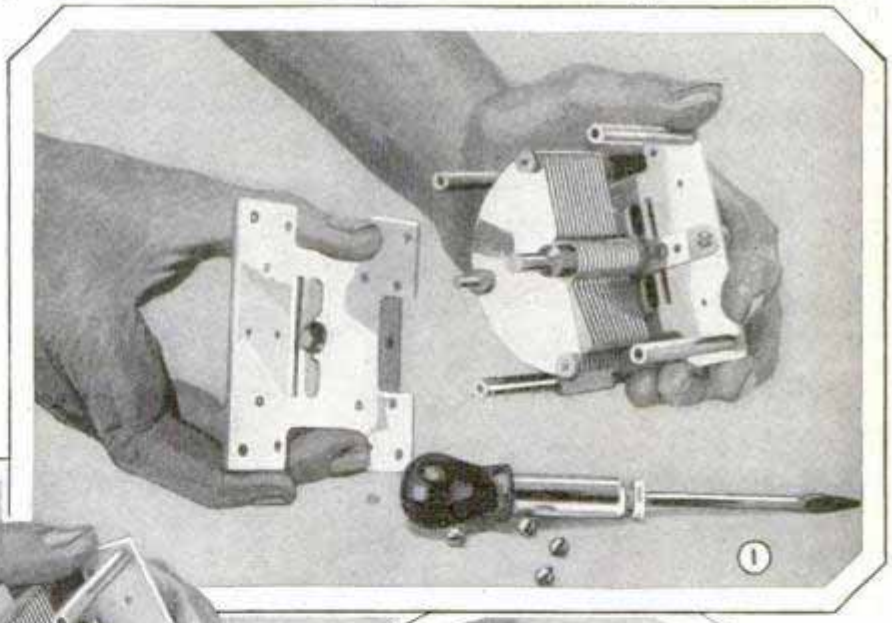
Remodeling Variable Condensers

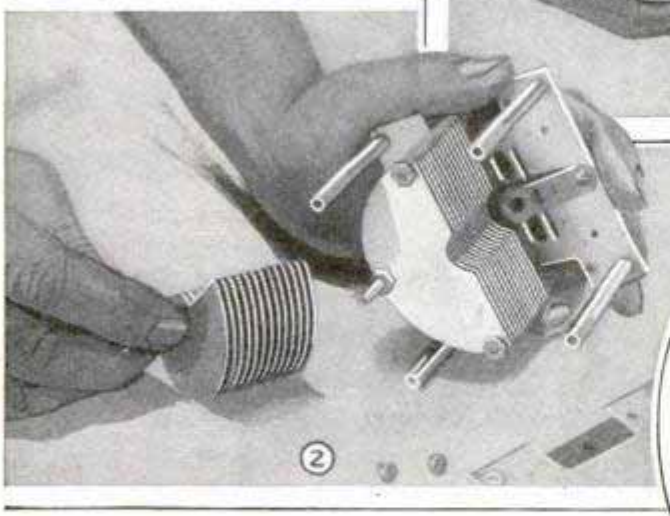
By LAWRENCE B. ROBBINS

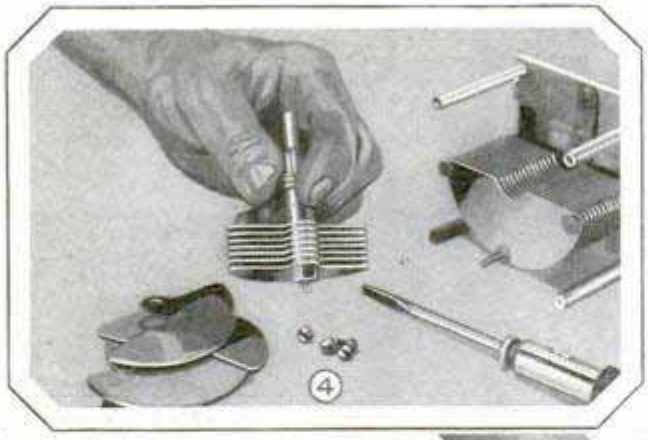
THERE are probably very few radio-set builders but what have from one to half a dozen variable condensers knocking about the workbench. And yet, when a new hookup calls for a condenser of a particular capacity or of a certain number of plates, he finds he has none to conform to the specifications. Consequently he buys a new one, not realizing that practically any condenser may be reduced in capacity by removing some of the stator and rotor plates. Some makes have enough room left on the rotor shaft and stator bolts so that one or two plates may be added to increase the capacity.

It is really a very simple matter to tear down a variable condenser; the accompanying photos were taken during the process of reducing the capacity of a standard make of condenser, and, by following them in numerical order, the general method of reconstruction can be easily observed. This particular condenser was built up of 27 plates and rated at .0005 mfd. A .0003-mfd. unit was required, and it was estimated that one of 13 plates would about fill the bill. Accordingly seven each of the stator and rotor plates had to be removed to approximate the desired capacity. But if the manufacturer rates his condensers at so many plates for a given capacity the problem is greatly simplified.

Photo No. 1 shows the first step; the four screws holding the faceplate to the stator pillar posts were removed and the plate gently pulled off. As a precaution always work gently on any condenser so as not to spring the plates or the frame out of line, because a bent plate will always cause trouble which care in disassembling and assembling will prevent. Any pigtail connections will, of course, have to be removed before taking off the faceplate to allow it to be pulled clear of the frame. When the plate is off, inspect the rotor shaft and bearing for grease, and, if any is found, remove it with gasoline or alco-

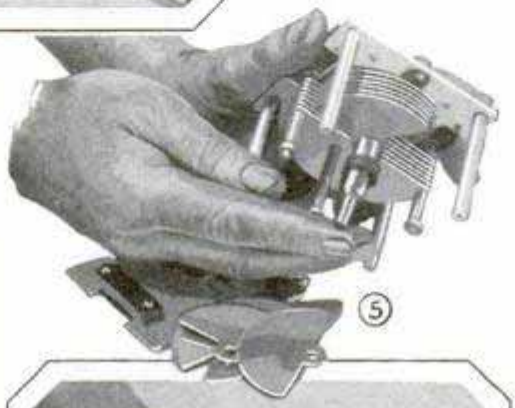






hol. Place all screws, bolts, nuts and minor parts in a small box so that none will be lost.

The next step is shown in photo No. 2. Here the rotor plates are turned until they are entirely out of mesh, so that the rotor unit can then be pulled from its front bearing. The condenser in question had a wiping contact from the rotor shaft to a spring on the front plate; the spring and shaft were thoroughly cleaned with alcohol before reassembling them.



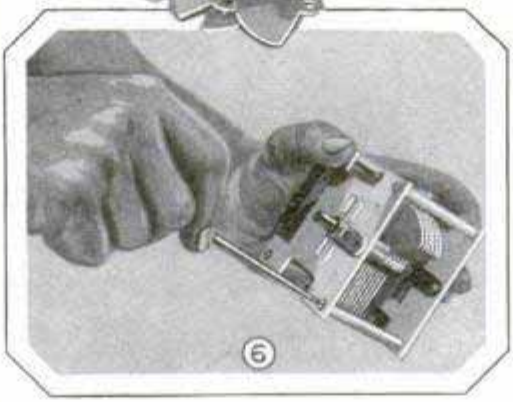


Photo No. 3 shows the removal of the proper number of rotor plates, the dial end of the shaft being held in a vise with a small piece of lead around it for protection in removing the retaining nut, bearing against the contact spring, with a wrench. This allowed the plates to be pulled off, one at a time, with their respective separator washers. After the required plates were taken off, the washers were put back on the shaft, with two or three additional ones to make up for the thickness of the plates removed. A little experimenting was necessary here because the plates and washers must make a compact unit when the retaining nut is threaded down on the shaft. The plates were lined up parallel by pressing the straight edges down on the bench as the nut was tightened.

The completely assembled rotor unit is shown in photo No. 4. The stator plates were removed by pulling off the pillar posts with their separators in the same manner. The required seven plates were left on and then the posts built up with the remaining separators and a few additional ones to make up for the plates removed. Washers for this purpose may be obtained from any radio-supply store for a few cents. Photo No. 5 shows the rotor reinstated in its bearing, with the plates partly meshed. The assembly is completed in photo No. 6, which shows the face-plate being replaced and screwed in position. This brings the rotor in alinement once more, and the plates should be properly separated as in the original unit. If the plates scrape or the spacing between them is not even, adjust the stator-plate pillar posts so that these plates will be changed with relation to the rotor, a slight turn on the nuts at either end accomplishing this. If your condenser had a pigtail contact, this should be reset or soldered in place after the condenser has been entirely reassembled and the plate distance adjusted. If a condenser has room for adding one or two plates the procedure is similar for increasing the capacity. Most condenser plates are of standard pattern, and may be picked up at supply stores, or oversize plates can be cut to match with a fine saw, smoothing all rough edges with a file. If a plate is bent in cutting, it can be straightened by pressing between two smooth pieces of board in a vise.

Extension-Cord Connector

Loud-speaker extension cords can be conveniently connected by the use of the connector shown. A pair of cord tips can be inserted at each end, and the cord can readily be detached.

Selecting the Correct Gridleak

In order that the vacuum-tube detector may work at its highest efficiency, it is necessary that the gridleak should be of proper value, and remain constant under all conditions, both operating and climatic. Otherwise there is much loss of energy and distortion. For the standard 201-A tubes, in average use, the gridleak should have a value from 2 to 5 megohms and for weak DX-signals from 5 to 9 megohms. For the 200-A type detector tube the range is from 1 to 3 megohms, and for DX-signals from 2 to 5 megohms. Since the B or plate voltage has something to do with the value of the gridleak, it is, of course, necessary to raise the value of the gridleak as the B-battery is increased. Most of the modern gridleaks have been improved to a point where they are now quite stable, and once the correct value for the particular tube is found the gridleak may be left permanently in the circuit. It is handy to have leaks of several values to experiment with.

Unit Prevents "Motorboating"

Owners of resistance-coupled receivers are well aware of the difficulty encountered when they attempt to hook up a B-eliminator to a set of this type. The put-put sound, generally called "motorboating," ruins reception. For the past year engineers have tried to correct this trouble and several good methods have been adopted. The unit shown in the photo is one of the best remedies for this type of trouble. To install it, remove the grid resistor in the middle stage, that is, the fourth resistor from the input end of the amplifier, and insert the resistor fastened to the flexible wires on the unit, which is then mounted on the baseboard or subpanel by means of the screws projecting from the bottom.

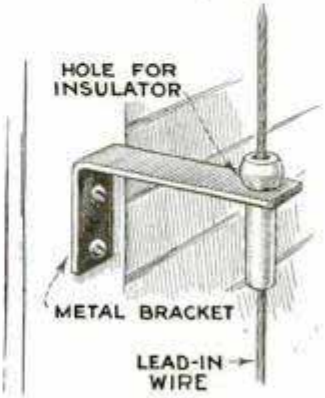
Left, A-Supply Unit with Cord and Switch; Right, B-Battery Eliminator

New Units Eliminate Batteries

The two units shown in the photo are designed to eliminate both A and B-batteries and are said to supply permanent full-strength power, both A and B, to operate sets employing from five to eight tubes, including the power tube. The units are of the dry type and said to be noiseless in operation; the maximum output of the A-unit is 2½ amp. at 6 volts. A receptacle is provided on the front panel for plugging in the B-supply so that both units may be operated with one light-socket connection. There is a convenient switch on the cord of the A-unit which controls both sources of power supply; the switch on the set is left on at all times.

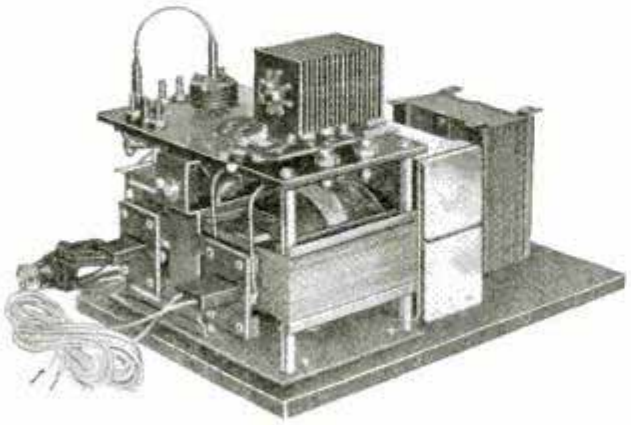
Stand-Off Insulator for Aerial Lead-In Prevents Swaying

A well-installed aerial should always be provided with some means of keeping the lead-in wire away from the building and preventing swaying in high winds. A simple extension mounting for supporting a porcelain insulator is shown in the sketch. A 5/16-in. hole is drilled in the metal bracket, the porcelain insulator inserted and the lead-in wire threaded through it. —B. Hoopes, East Berlin, Pa.



A-Power Unit for Set Builders

This A-power unit can be assembled in from half an hour to an hour by anyone who can solder eight simple connections. No knowledge of radio is necessary to do the job, as the various parts are all



Completed Unit Shown without Metal Cover

plainly marked for position. This new device, now available to all, makes possible an efficient, dry, low-priced substitute for the A-battery. No tubes are required, no electrolytic action is employed, there are no acids, alkalies or liquids, and no moving parts. One of the features of the unit is the special type of dry condensers used. They have a capacity of 1,500 mfd. and are crowded into a space 2 by 2 by 8 in. in dimensions. The tests show the unit to be without hum, when a pair of headphones are connected directly across the output; this is an unusually critical test and assures the user a source of silent A-power for sets employing up to eight tubes, one of which may be a power tube. The knocked-down unit is complete to the last screw, and a metal cover comes with it.

Directional Short-Wave Radio Telegraphy

The usual system of radio transmission creates a series of electrical waves that radiate in all directions, and by means of these waves readable signals are sent out. This is fairly well understood by the average person today, but the new system of "beam" or directional transmission is not so well known. This system confines the waves in a path or beam, similar to the rays of a searchlight when focused on a distant point. Experiments along this line were successfully conducted in 1922 by Signor Marconi, and short waves were found to be best for this particular type of transmission. The aerial employed in the beam method differs from that used in the long-wave transmission in this:

The usual antenna consists of horizontal wires suspended between two or more high masts. The aerial for the new system consists of two units; all wires are suspended vertically from horizontal supports fastened to the crossarms of five masts, each wire being weighted to hold it taut. One unit consisting of 16 vertically suspended wires faces the station with which it is intended to communicate; the other, of 53 vertically suspended wires, is called the "reflector," and is arranged in a semicircle behind the first unit. The waves transmitted from the 16-wire unit proceed outward in the same manner as in the usual system, in all directions, but the waves that would ordinarily escape in the direction opposite to the receiving station and be lost in radiation are prevented from doing so by the network of reflector wires at the rear, which redirect this energy forward in the path of the main aerial unit. At the receiving station the same type of two-unit aerial is used, the reflector wires intercepting the energy of the advancing wave, and reflecting it to the "collector" or main aerial unit, thus increasing the strength of the signals.

Speaker Employs Pyralin Cone

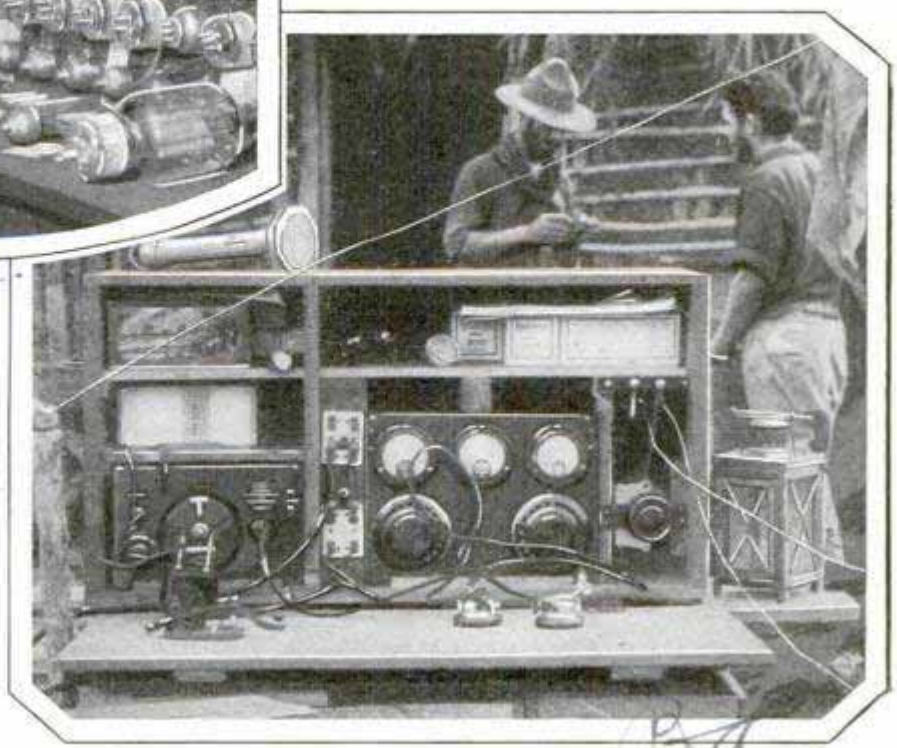
One of the new cone speakers lately introduced employs a cone of pearl pyralin. It stands 19 in. high and the cone is 17 in. in diameter. The material being

uniform in texture, it is claimed the cone has no vibrating period of its own and responds to all notes with equal efficiency, and, unaffected by moisture, heat or cold, it is said to be ideal for speakers of this type. The speakers are available in a variety of colors, the mother-of-pearl effect being quite apparent in the photo.

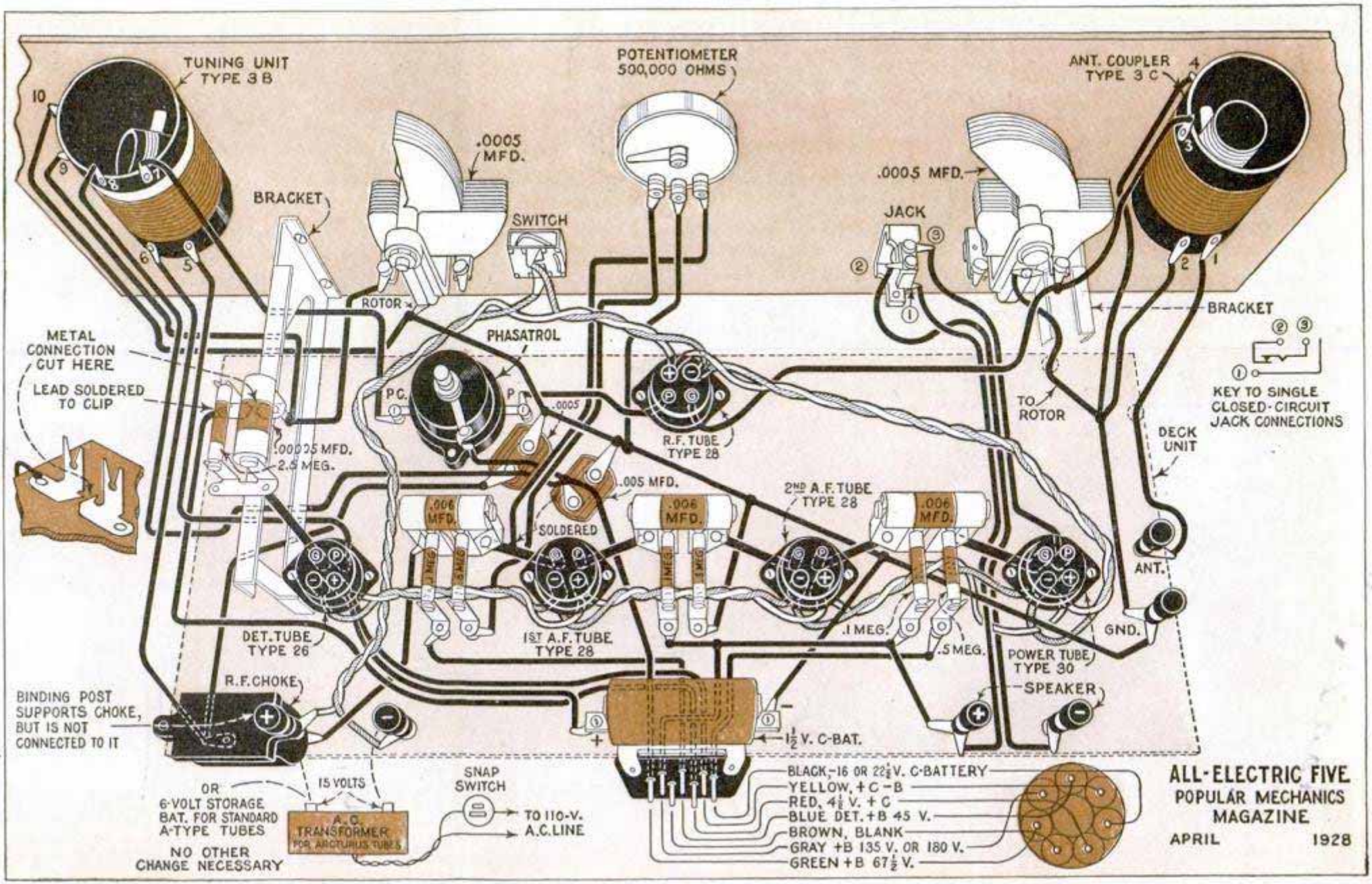
Facts and Fads for Radio Fans

Bernays Johnson Conducting an Interesting Demonstration of Apparently Reversing the Force of Gravity by Radio Energy; the Metal Plate Is Forced against the Operator's Hand Instead of Falling to the Table

James Cantwell Instructing Miss Edith Nelson How to Operate the New Coin-in-the-Slot Radio Receivers Recently Installed in the Hotel Sherman, Chicago; the Instrument Is Designed to Operate Thirty Minutes for Each Quarter Deposited; after Dropping the Coin, the Set May Be Tuned to Any Station Desired



Above, Transmitting Tubes Ready for Final Factory Tests; These Tubes Are Somewhat Larger Than the Familiar Receiving Tubes as Demonstrated by the Comparative Size of the Young Lady Shown in the Photo; Right, Comm. G. M. Dyott's Radio Apparatus, Including ~~Dry-Battery-Powered~~ Transmitter, in Use on His River of Doubt Expedition; Similar Equipment Will Be Carried on His Patagonia-Panama Exploration Trip



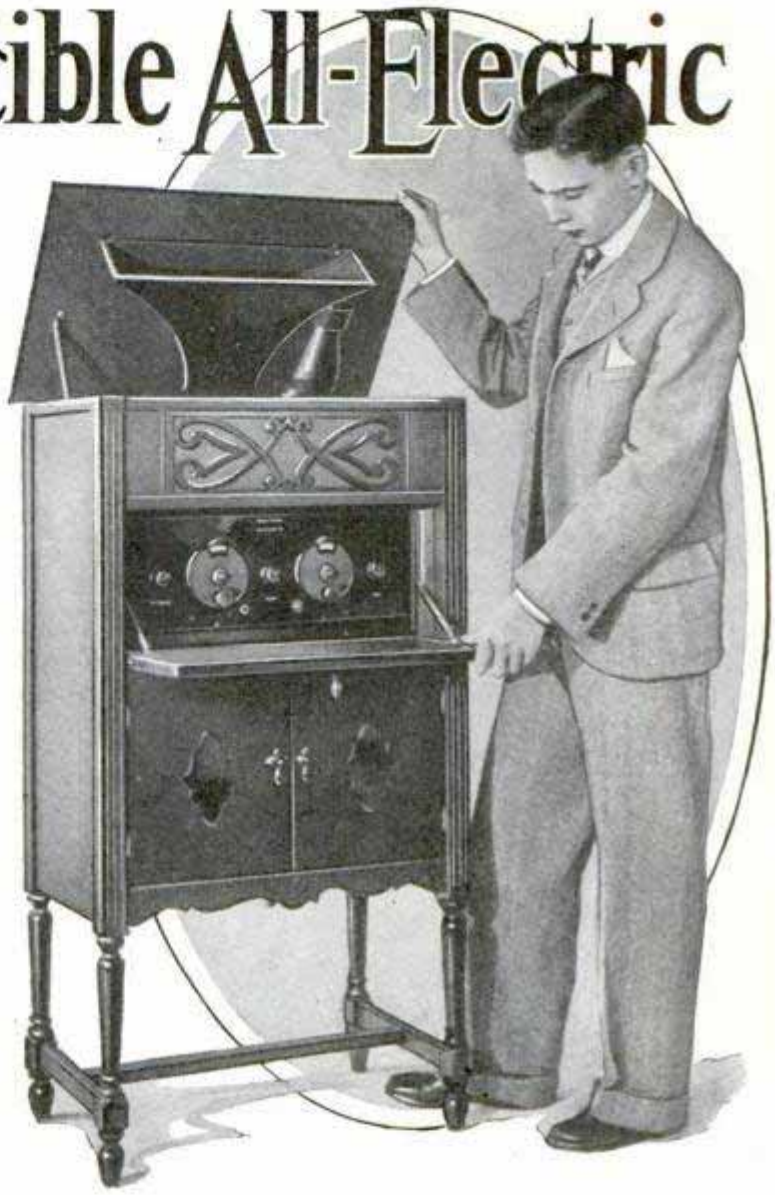
ALL-ELECTRIC FIVE

POPULAR MECHANICS MAGAZINE

APRIL 1928

The Convertible All-Electric Five

by Frank L. Brittin



ALL-electric or light-socket operated sets are now a chief topic of conversation among radio fans, and there are a number of very good a.c. tubes available for these receivers. Many who would like to try out these tubes hesitate, however, because most of the circuits look complicated. But here is a set so simple that even the average ten-year-old boy can build it; in fact, it is partly built before you start.

Designed, built and thoroughly tested in our own laboratory, this set combines several unusual features that we believe will be of interest to anyone who wishes to try out the latest development in all-electric sets at a reasonable price for parts. Equally efficient on either the new a.c. or standard d.c. tubes, the set tunes sharply, has excellent tone and plenty of volume and range. Although designed for the a.c. tubes specified, ordinary tubes also fit the sockets, an A-battery may be substituted for the 15-volt transformer and the set so operated without making any change in the circuit, and either a B-eliminator or three 45-volt B-batteries used in either case. As in most all-electric sets, the C-batteries are not considered as batteries, and will usually be found hidden in some inconspicuous location of the set, and need be replaced only about once a year.

The a.c. tubes used look exactly like the standard ones; are of the heater type and contain four elements: the heater, the cathode, the grid and the plate. Only four prongs are required for the connections; therefore, the tubes can be inserted in standard UX-type sockets. The tubes will operate satisfactorily at any point between 12 and 18 volts. However, the 15-volt a.c. supply recommended should be maintained as closely as possible to obtain the best results. Step-down transformers such as used for operating toy trains may be employed, but the transformer especially designed for the tubes is preferable. They sell at $5 and are provided with a means of compensating for differences in line voltages.

The current required for each tube is but .35 amp., so that ordinary flexible rubber-covered hookup wire may be used for the filament wiring. The tubes are wired in parallel in the usual manner, except that the wires are twisted to eliminate any possibility of hum. Note that the circuit is a standard type, consisting of one stage of tuned r.f., regenerative detector and three stages of resistance-coupled audio amplification, the only difference being that all grounds are eliminated from the

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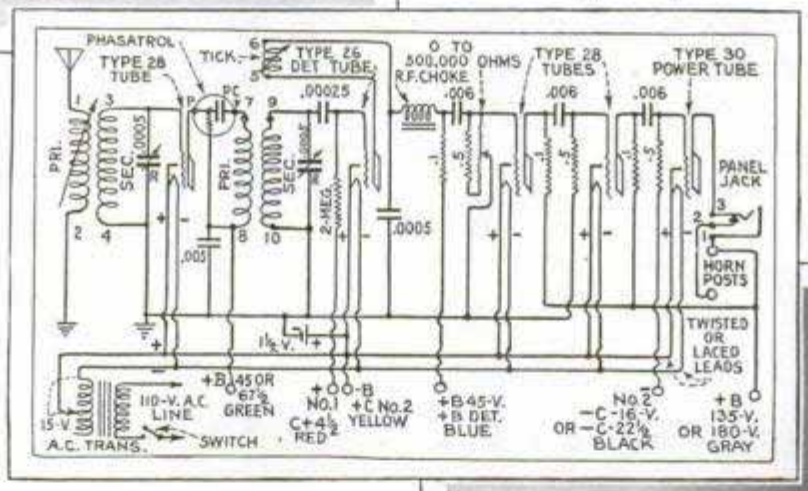
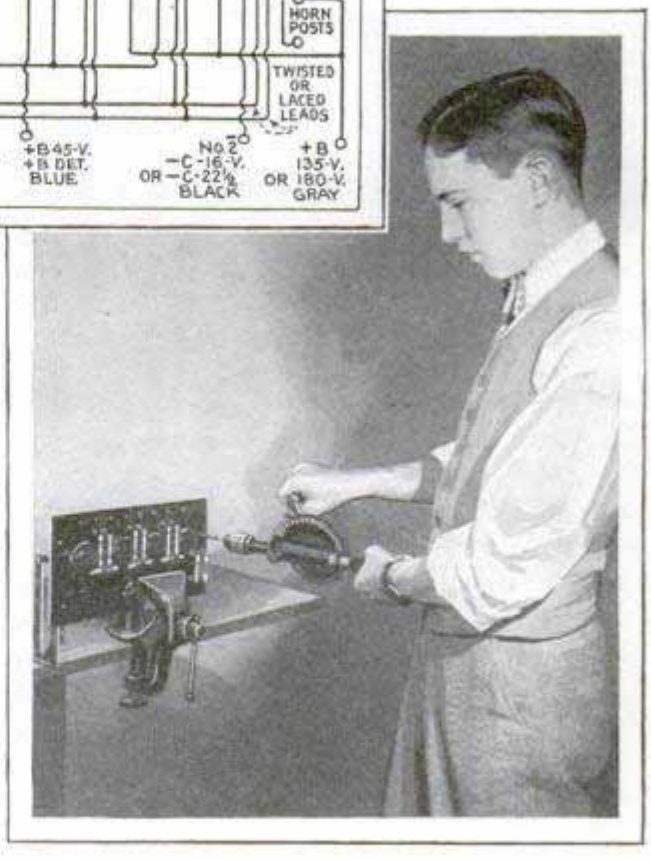


Above, Pointing Out Condenser to Be Shifted to Clip at Right, Photo Shows Deck with Mounting Brackets in Position; Right, Schematic Diagram; Below, Deck Held in Vise Prevents Damage to Instruments While Drilling for Brackets and Balancing Device

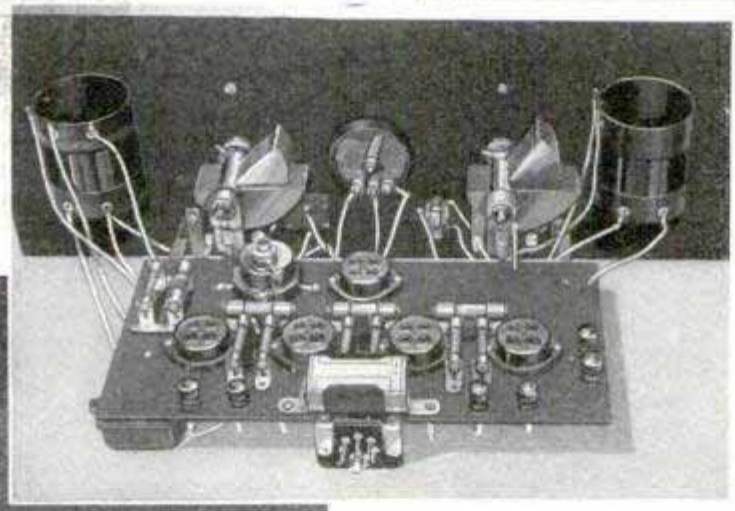


The wiring diagram (page 654) tells the wiring story very clearly, the wires under the subpanel or "deck" being as if the deck was made of glass instead of bakelite. This deck or subpanel unit comes with the sockets, resistors and cartridge-type condensers already mounted, and the wide black lines show the connecting strips that are also a part of the unit. The only change required is in the grid condenser and gridleak at the extreme left and pointed out in the upper photo on this page, the position of the two being reversed. To this end, it is necessary to sever the front-support clip, so that the gridleak will not be shunted across the condenser, and to take the front gridleak connection to the positive 4½-volt C-battery, for the positive grid bias necessary for the detector tube. The sketch at the left of the deck shows the connection cut, the cutting being done with a sharp three-cornered file or hacksaw, and one edge turned up to insure separation. The balancing device, shown at

filament circuit; all grid returns, except from the power tube, are grounded, and the necessary biases, excepting the detector, secured by connecting the bias potential to ground. A positive bias of 4½ to 9 volts is applied to the grid of the detector tube through either a 2, 3 or 5-meg. gridleak, the best value to be found on trial. The negative lead of the 4½-volt C-battery can be connected either to the B-negative post or to the ground. The power tube is biased in the usual manner, 16½ volts negative, with a 135-volt B-plate voltage, and if 180 volts B-voltage is used, the negative C-bias should be 22½ volts. It is not practical to use a rheostat with a.c. tubes, but with standard tubes in the set, a 3 or 6-ohm combination switch-rheostat may be employed instead of the panel switch specified.

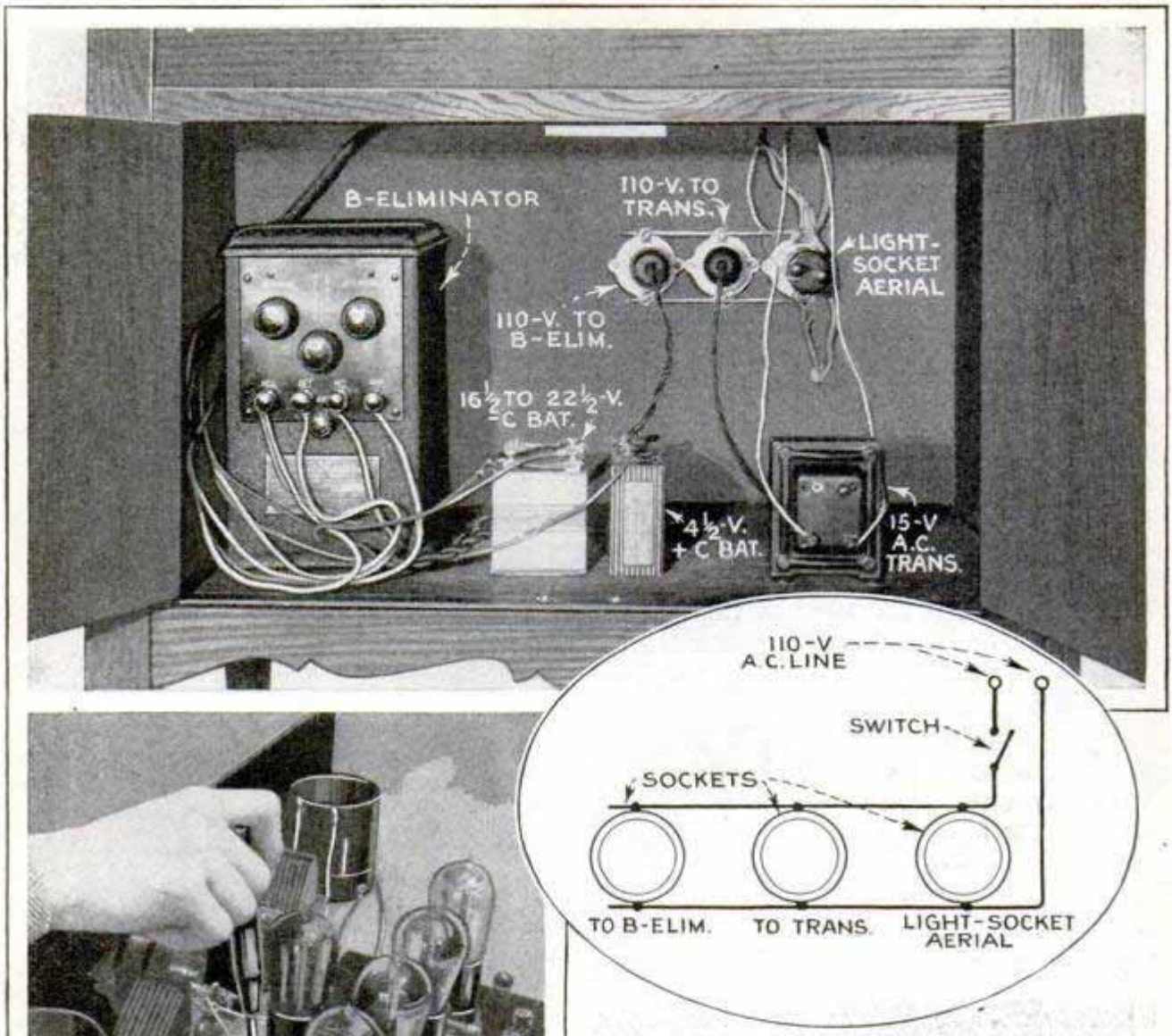
front and to the right of this unit, is for balancing the r.f. stage, and, when once

adjusted, which should be done when the set is ready for operation, needs no further attention. The deck is provided with a row of holes along the edge at the rear for binding posts. The two for the 15-volt filament supply are mounted at the left, one marked positive, acting as a mounting support for one side of the choke coil underneath. This post is not connected electrically to the coil. The connection to the coil, on this side, is from the lower lug, and the black wire leading from it goes to the resistor and .006-mfd. condenser. The lead from the binding-post lug goes to the white twisted filament lead indicated as positive. When the 15-volt a.c. transformer and a.c. tubes are used, there are no polarity values. The 1½-volt C-battery, of the round flashlight type, is mounted at the right in the center by means of two small brass angles. The connector-plug receptacle is mounted directly under this C-battery, and the speaker, ground and aerial posts at the right. The subpanel brackets are mounted so as to leave room between the front panel and the deck for the two variable condensers. The tuning unit and antenna coupler are not marked with the terminal numbers shown in the diagram. Therefore, place the shaft of the rotor coil through the front panel at the rear and screw on the nut in front, holding the coil in the position shown. The rotors must be next to the bottom of each of the large coils; now number each terminal in the rotation shown in the simplified diagram.



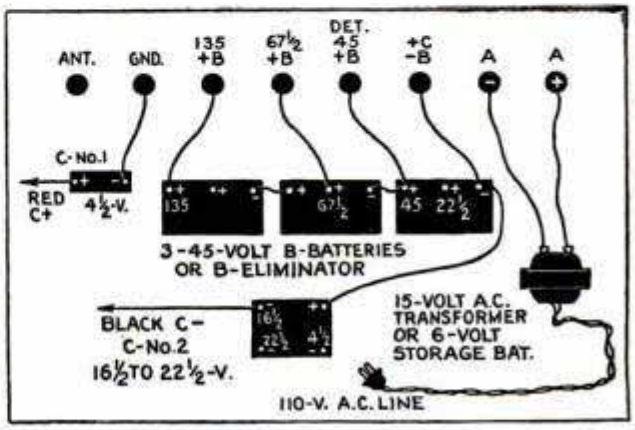
Above, Mounting Clips for Small C-Battery; Left, Rear View of Completed Set; Below, Attaching Cable Plug

When the set is hooked up and the tubes in position, each in the proper socket indicated for its particular type, the set is ready for test and balancing. Connect the 15-volt transformer to the set with long flexible leads, so that it can be placed from 2 to 3 ft. away from the set. The snap switch is connected in one side of the 110-volt a.c. supply line; the small power switch on the front panel of the



Top, Interior View of Lower Console Compartment; Below, Wiring Diagram for Socket Bank; Left, Adjusting Balancing Device

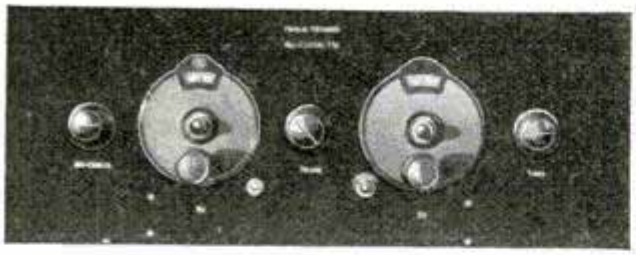
set is then turned on and left in the on-position, and the set is operated by turning on the snap switch in the 110-volt line. If a B-eliminator is used with the a.c. tubes, the power switch on the front panel can be used to operate both units by taking it out of the filament line. Splice and solder the negative filament line together again and run twisted lampcord leads from the supply directly to the switch on the set. Two or three ordinary porcelain lamp sockets may be used in the manner shown in the insert sketch on this page; these may be mounted inside the lower compartment of the console, or, if a cabinet is used, they may be placed behind the table, out of sight. The sockets are wired in parallel and the set switch connected in one side of the 110-volt line, the other side of the line going direct to the other side of the bank of sockets.



Hookup for Either Batteries or B-Eliminator

The B-eliminator and 15-volt a.c. transformer are then plugged into their sockets and the third socket is used for one of the new type light-socket aerial plugs. This type of antenna gives excellent results and eliminates the outside aerial.

The balancing device is adjusted by means of a screw in the center of the unit. Before attempting to tune in a station, turn the adjusting screw in a clockwise direction as far as it will go. Then turn on the 110-volt switch. Several seconds will elapse before the tubes heat up to the operating point, when a hiss will be heard in the loud speaker; then rotate the condenser dials, in step, until a station is heard. When a good clear signal is obtained, turn the adjustment screw slowly back in a counterclockwise direction until the station comes in with maximum volume without oscillation, and leave it at this point. The rotors of the tuning unit and the antenna coupler are set to the point of greatest selectivity and need not be changed except for distant reception or when extra-sharp tuning is necessary. If standard B-batteries and ordinary tubes are used, the panel switch is left wired as shown, controlling the A-battery; if a B-eliminator and standard tubes, with trickle charger and storage battery, are

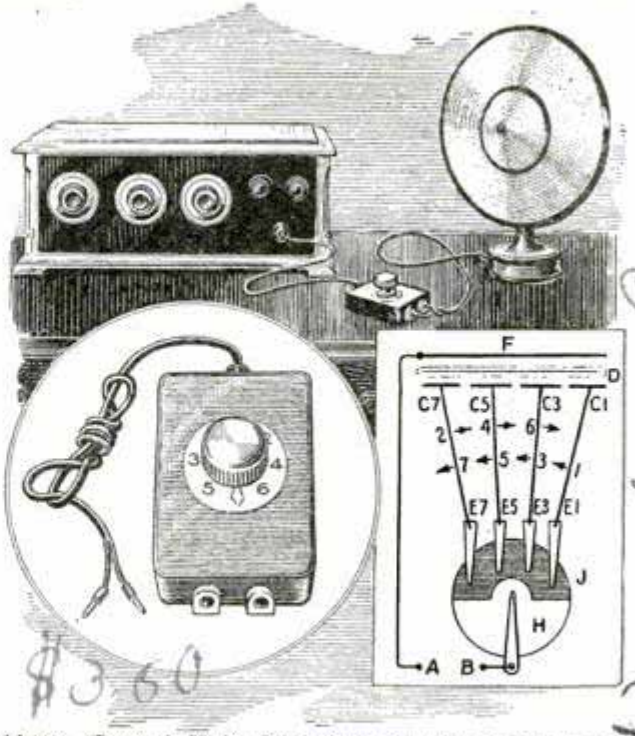


Front View of the Panel, Showing the Neat Layout of the Dials

employed, one of the new relays may be used so that the panel switch will operate the entire installation.

The material list for the set, specifying each part used in the original model together with the price of each item, is available to all without charge. A postcard will bring it.

Carefully prepared blueprints of the simplified wiring diagram and full-size drilling templates have been made and may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents to cover cost and mailing. Specify blueprint No. 131.



Above, Control Unit Connected between Speaker and Set; Below, Control Dial and Condenser Arrangement

Variable Tone Control

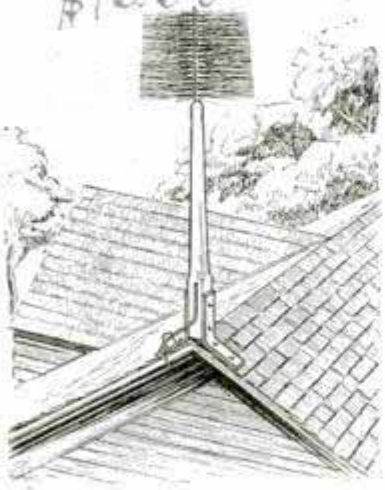
Designed to enable the radio owner to adjust the tone to the most agreeable quality, this unit has several novel features. By means of an arrangement of condenser capacities and a fantail, or commutator-type, switch, seven different capacities, ranging from .005 to .035 mfd., are obtained. The arrangement of the capacities is shown in the insert, A and B being the two terminals of the device; F the plate of the condenser bank that is common to all four condensers, and D the insulator or dielectric between the plates. As the switch is moved from zero to the numbered positions, the capacities are shunted across the transformer winding or the loud-speaker terminals.

Avoid Spilling Electrolyte on Storage Battery

When transferring a storage-battery hydrometer from one cell to another, be sure not to spill any of the electrolyte on the top of the battery for in such a case there will be a loss of acid and this may also provide a path for electrical leakage between terminals. Always keep the top of the battery clean and dry. This is done by first wiping it off with a rag moistened with ammonia or vinegar, and then with a rag saturated with plain water, after which a dry rag is used to remove the water

Aerial Is Designed like Brush

A new aerial looking very much like an oversize wire brush has recently made its appearance on the market. The design is based on the idea that electrical energy is most naturally and easily attracted to sensitive wire points. This multi-point antenna has a thousand such points, to receive signals from all directions, and it is claimed to be less affected by static and highly selective.



Radio-Announcer Outfit

The announcer outfit shown in the illustration is designed to enable radio and phonograph dealers to make announcements through the amplifier and speaker of radio sets or phonographs. It consists of a high-powered microphone and a control box having a cord with an adapter for slipping over the prongs of the detector tube in the set. There are three pin jacks in the side of the control box to receive the microphone cord, and two additional pin jacks to receive the terminals of a magnetic pick-up for playing phonograph records. The control box is also provided with a volume control, and a three-position key-type switch for changing from radio or voice to phonograph.

Rotation of B-Batteries

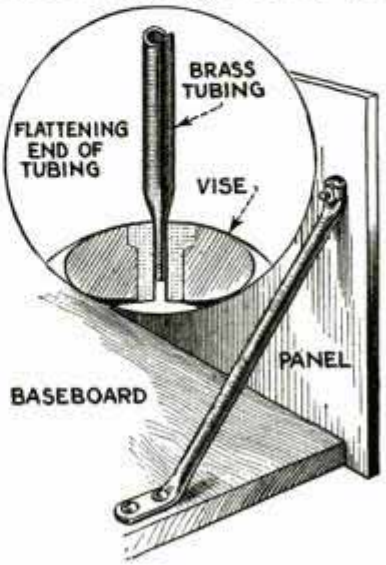
The B-battery used to supply detector plate voltage is usually the first to become exhausted, because of the greater plate-current draw of the detector circuit in a receiver not equipped with a power tube. This battery or section of a battery will drop down to the low-voltage limit before the other batteries, and therefore it is a good idea to disconnect the batteries and rearrange them, placing the one having a low reading on the amplifier side, and using the battery which previously was the second one, for the first. When this too has become exhausted, rearrange the batteries again, using the third battery, in case there are three, for the detector voltage. By this practice the drain on the batteries is more evenly distributed, and it will be found that the period of their service can be increased from ten to twenty per cent.

Soldering Connections to Iron

Anyone who has attempted to solder a connection to a piece of iron has found the operation very difficult, as in the case of a receiver diaphragm for instance. Ordinary flux is useless for doing such a job, but if a few grains of copper sulphate are rubbed over the cleaned metal surface to be soldered and then the flux applied, the solder will readily adhere.

Panel Brackets Made from Brass Tubing

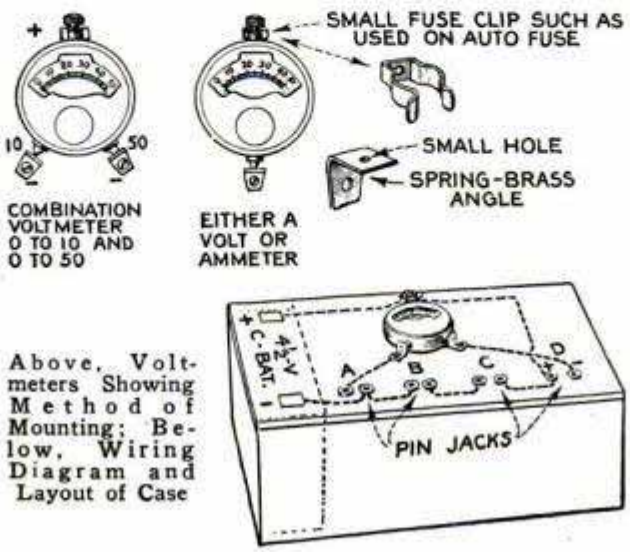
If suitable commercial panel brackets are not at hand, excellent substitutes may be made from pieces of brass tubing, as shown in the illustration. After cutting the tubing to the required length, the ends are flattened in the vise for a length of about ¾ in. The ends should be trimmed and rounded off with a file; the holes for the mounting screws are then drilled in each end. Make a pair exactly alike and after drilling the ends, bend them so that both angles are the same; the bending is done in the vise with the aid of a 45° bevel square; the tube is of ¼in. diameter.



THESE valuable kinks have been written especially for Popular Mechanics Magazine by prominent radio experts. They represent not merely ideas, but practical advice from the best technicians in the profession on methods that will help make your set more efficient in operation, more convenient to handle or easier to build.

Building an Inexpensive Test Set

Requiring a small portable test set for repair work, I built this one at a very small cost, which covers almost any kind of testing both for the amateur and trouble shooter. The illustration is self-explanatory and requires but little comment. The double-reading voltmeter at the left is for general-purpose testing; the volt or ammeter at the right, prepared for mounting in the same manner, is only utilized where higher voltages or ammeter readings are necessary, in which case it is wired to suit the requirements of the test. The wiring for the double-reading voltmeter fastened to the top of the case is shown below. The case should be deep enough to contain a standard 4½-volt C-battery unit at one end as shown. Small midget jacks, of the type designed to take phone tips, are mounted in pairs on the top of the case at the points indicated, and the wiring completed. Flexible test leads terminating in phone tips, plugged into the jacks D, provide a means of checking the condition of B-batteries by a direct reading from the voltmeter, one 45-volt B-battery unit being tested at a time. Now by plugging a pair of headphones in the jacks C and plugging the test leads in jacks B, I can test for open circuits in transformers, loud speakers or any unit of high resistance by listening for the click in the phones. When the test leads are plugged in the jacks A, the 10-volt side of the meter is in series with the 4½-volt C-battery, and will give an accu-

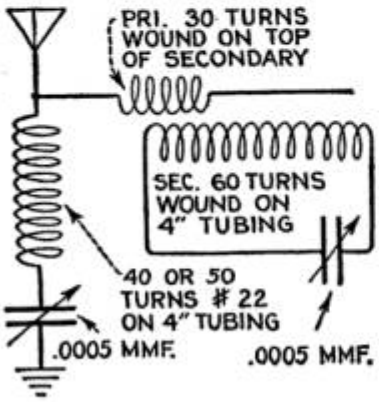


Above, Voltmeters Showing Method of Mounting; Below, Wiring Diagram and Layout of Case

rate test on the condition of filament circuits, rheostats, shorted condensers and open or shorted coils.—H. G. Nebe, chief engineer, Station WSMB, New Orleans, Louisiana.

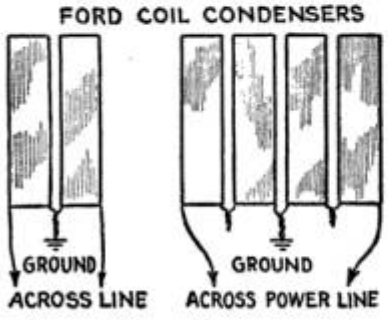
Simple Wave Trap

I have been experimenting with wave traps and have finally hit on a simple one that any amateur can make at a very small cost. The diagram tells the entire story, so very little comment is necessary. The 4-in. tubing may be a section of mailing tube or bakelite tubing, as the builder prefers, No. 22 cotton-covered magnet wire being used for all three coils.—C. R. Yarger, chief radio operator, Station KFNF, Shenandoah, Iowa.



Eliminating Power-Line Hum

Noise in the set is frequently traced to some motor, such as an electric fan, washing machine or a general commutator hum from the power line itself. Such noises may often be eliminated by placing condensers of large capacity across the line. These are expensive, but serviceable units may be built up from discarded Ford coils, which can often be had for the asking at a garage or service station. The coil boxes are opened and the condensers removed, care being taken not to break the lead wires. For an electric-fan or washing-machine motor, two of these condensers are usually sufficient. The condensers are connected in series and a center tap is taken off and grounded as shown at left. The two outside ends are connected across the supply line or motor that is suspected of causing the noise. If two condensers are not sufficient, the size of the condenser bank is increased and tapped to ground as shown at the right, until the proper number to eliminate the noise is found. The condensers should be connected in series, then placed together and held with a heavy rubber band. It is a good plan to test the condensers for a short circuit before using them, as very often a coil is discarded because of a defective condenser.—H. R. Wallin, radio operator, S.S. "Cornelia," Brooklyn, N. Y.



Suppressing Excessive Oscillation

The sketch gives a few helpful hints that may not be known to the average radio fan. I have found them useful and am glad to pass them on to others. To suppress excessive oscillation in a superheterodyne receiver, wind two or three turns of wire in the form of a closed circuit around the outside of the first or second and, in extreme cases, both intermediate-frequency transformers, as shown at the top. The same method may remedy similar oscillation in tuned r.f. circuits employing either solenoid or spiderweb coils. The simple testing outfit below consists of a pair of phones and a 4½-volt C-battery connected in series. With this simple combination, coils may be checked for open circuits, and general continuity tests made in any circuit. If the circuit is complete, a distinct click will be heard through the headphones.—E. L. Watkins, radio engineer, Trego Radio Manufacturing company, Kansas City, Mo.

¶Popular Mechanics radio department offers its information service free to all readers of our magazine. We will be glad to help you with your radio problems and will promptly answer all inquiries directed to this department.

General Care of Tubes

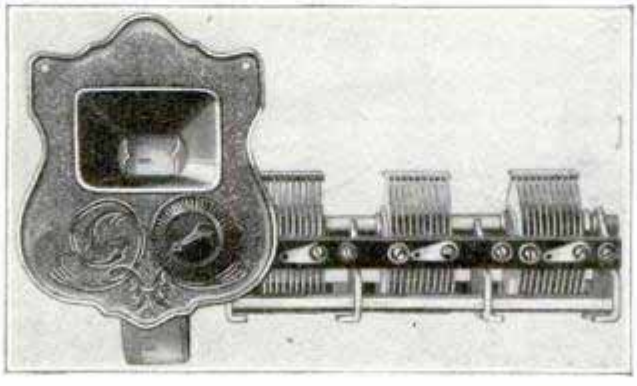
Always treat radio tubes with care; never tap them severely or put them down with a jar. Dropping a tube nearly always ruins it even if the glass does not break or the filament still lights. Keep the ends of the tube tips clean with fine sandpaper or emery cloth to prevent corrosion, which sets up a high electrical resistance and reduces the efficiency of the receiver considerably. It should be remembered that tubes are the most important factor in a radio receiver and should always be kept in good condition.

A Wiring Kink

When wiring sets from blueprints or diagrams it is a great help, as each wire is placed in position and soldered, to mark it off on the diagram with a colored pencil. In this way, if the work is interrupted, you need not trace the wires in the set to see where you left off. It is generally best to run all filament wiring first, next the grid wiring, keeping all grid leads as short as possible, and then the leads for the plate circuit.

Ganged Condensers and Drum Dial in One Unit

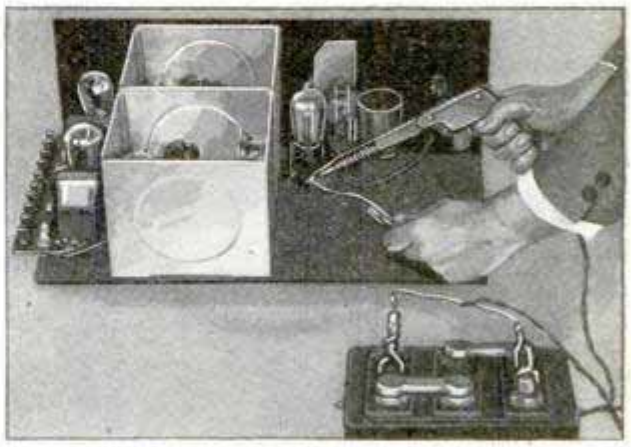
A three-ganged condenser combined with a drum-dial control and neat escutcheon for the front panel, all in one unit, is one of the latest devices offered to the radio-set builder. The escutcheon shield is made of bronze, and the drum dial, of pressed steel, is calibrated from 0 to 100. The drum action is smooth and powerful and no backlash is encountered, due to the friction drive employed. The variable condensers used are of .00035-mfd. capacity, balanced and ganged on one shaft; the condensers and drive mechanism are all assembled at the factory so the unit is ready for instant installation on the subpanel of the receiving set.



Three-Ganged Condenser, Showing Drum Dial and Escutcheon in Position Ready for Mounting

Soldering "Gun" Operates on Battery

The portable soldering iron having the appearance of a gun operates from any 6-volt storage battery, and solves the problem of soldering in unhandy positions and in locations where it would be almost impossible to use an iron of the ordinary type. The point is heated instantly when the trigger switch is pulled; there are no coils to burn out, and the energy required is adequately supplied by the battery. No current is wasted, as the iron is heated only during the actual soldering operation. The tool is designed primarily for work on cars and radio sets.



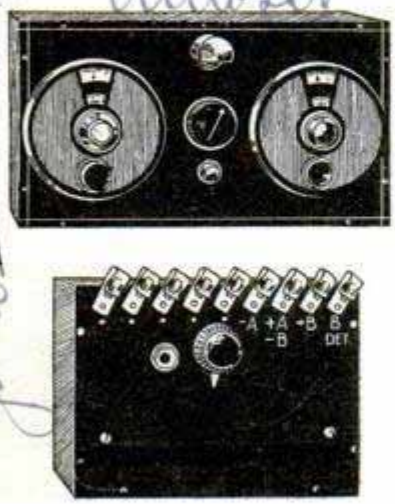
Soldering Gun in Use, Showing Connections to Storage Battery at Lower Right

Proper Testing of Condensers

Simply touching the tips of the headphone test set to the two sides of a condenser and listening for the "click" does not provide a reliable test, for the click will be heard whether the condenser is short-circuited or not. The condenser must be charged by connecting it for an instant across the terminals of a 6-volt battery, then, after waiting a second or two, it is discharged through the phones. A click will be heard if the condenser has held the charge. A surer test is to connect a voltmeter in series with dry cells; if the needle deflects when the circuit is completed through the condenser, the latter is shorted.

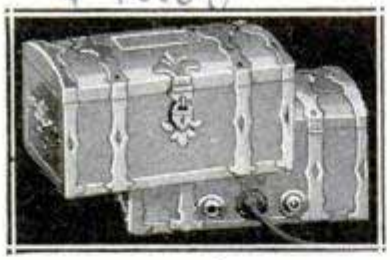
Dashboard Radio Receiver

Designed to be attached to the dashboard of an automobile, the compact 4-tube receiver shown in the drawing is said to give satisfactory loud-speaker reception, using only a small antenna, strung inside the top of the car. The car battery supplies the filament current, while the B-batteries are stored under a seat. The receiver itself is contained in a case, only 3½ in. deep, and has two bolts to permit attachment to the dash.



Output Transformer Made Like Treasure Chest

An output transformer, having the appearance of a cigaret container in the shape and design of a treasure box, is now available. It is finished either in antique bronze, silver or brass, and in a walnut shade so as to harmonize with the cabinet or other furnishings. The case conceals a standard output transformer, and the unit may be placed at any point near the set. It is designed to be connected between the output of the receiver and the loud speaker.



Overheating a Storage Battery Shortens Its Life

Overheating of a storage battery may be caused by too heavy a rate of charging, by insufficient electrolyte or by internal short circuits in the cells. The plates become buckled or broken and this may in turn cause the insulators to break, permitting adjacent plates to touch each other, which also causes a short circuit. Besides warping the plates, overheating may cause the material on the plates to shed and drop away from the grids. Furthermore, overheating causes the electrolyte to get hot, which results in excessive sulphation of plates and also causes the electrolyte to evaporate quickly.

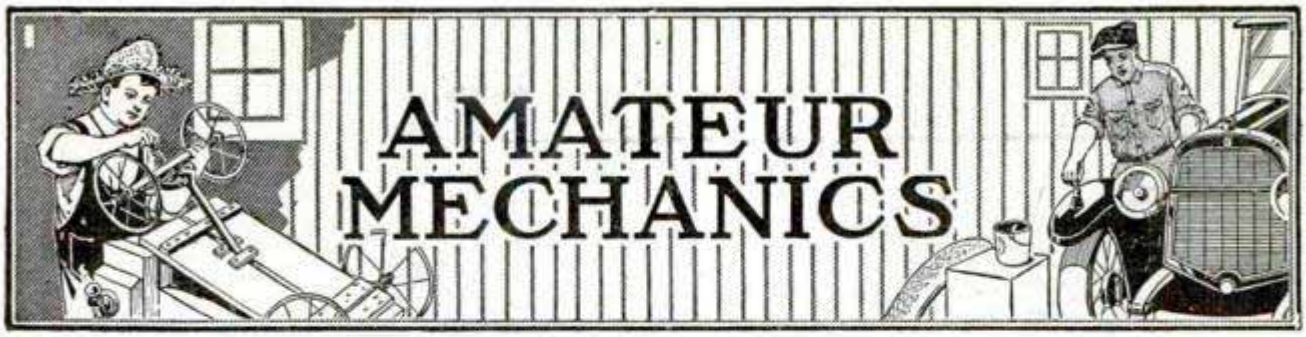
Adjusting Grid Bias of Vacuum Tubes

The most satisfactory method of adjusting the grid bias is to insert a 0 to 10-reading milliammeter in the plate line to the tube. The plate and grid voltages are then adjusted so that, when the receiver is set in operation, the milliammeter needle will not fluctuate; even when strong signals are reproduced. If the needle deflects toward zero when a specially strong signal is reproduced, the C-voltage on the grid is too high, and if it deflects in the opposite direction, the C-voltage is too low. When the grid and plate voltages are correct, there should be no appreciable fluctuation of the needle, when a station is tuned in or out. Ordinarily, it will be found that the use of correct C-voltages as recommended by manufacturers will give satisfactory results. However, to adjust the C-voltage accurately, connect a variable resistance in series with the C-battery and the grid of the tube.

Simple Device Aids Selectivity

The simple tuning device shown in the illustration is designed to be used between the radio set and aerial to obtain closer tuning of the set. Available at a very low price, the unit may be used with any set employing an aerial, and can be installed by a novice. It consists of a coil of enameled wire wound on a short length of tubing, a slider arm and fixed condenser. Two Fahnestock clips are provided for the connections.

¶Interference from X-ray machines may be confined to a limited range by proper installation and careful shielding.



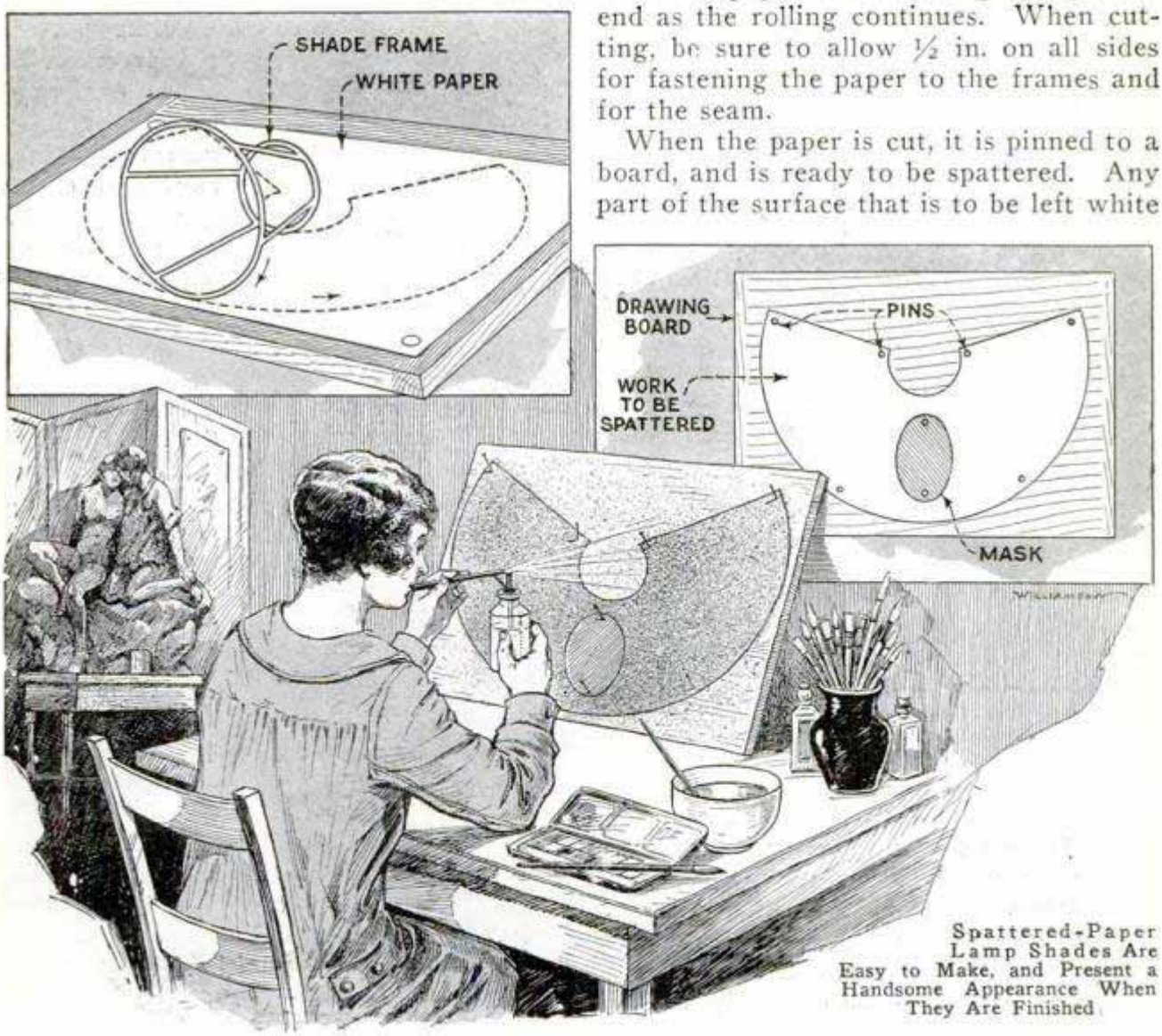
Making Spattered-Paper Lamp Shades

By HAROLD JACKSON

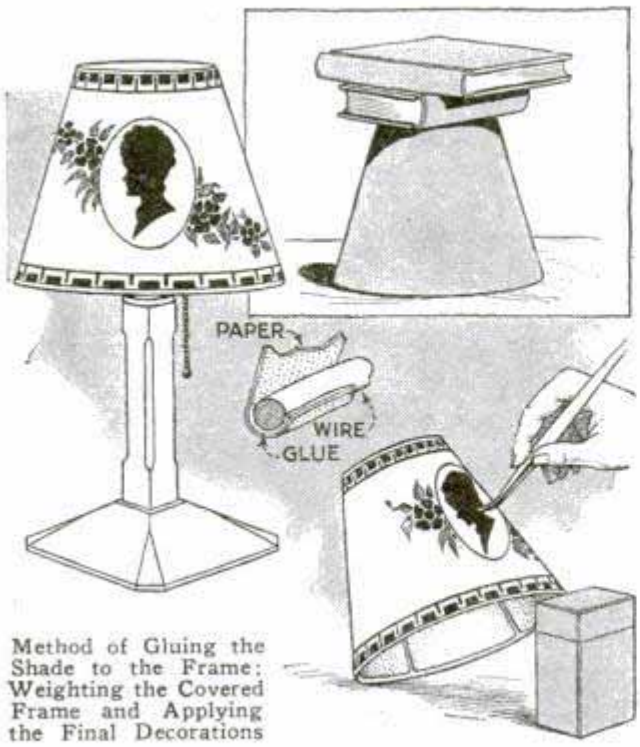
SPATTERED-paper lamp shades are easy to make, durable and very attractive. They consist of a wire frame covered with strong white paper which has been spattered with bright water colors until the surface is almost completely filled with myriads of tiny dots. They are usually decorated by painting some floral or scenic design on them in black or dark water color.

The wire frames can be obtained in a variety of shapes and sizes in almost any town or they can be made at home. Strong white drawing paper is the best material to use for covering the frames. A perfect fit is obtained by rolling the frame over the paper and marking along each end as the rolling continues. When cutting, be sure to allow ½ in. on all sides for fastening the paper to the frames and for the seam.

When the paper is cut, it is pinned to a board, and is ready to be spattered. Any part of the surface that is to be left white



Spattered-Paper Lamp Shades Are Easy to Make, and Present a Handsome Appearance When They Are Finished



Method of Gluing the Shade to the Frame; Weighting the Covered Frame and Applying the Final Decorations

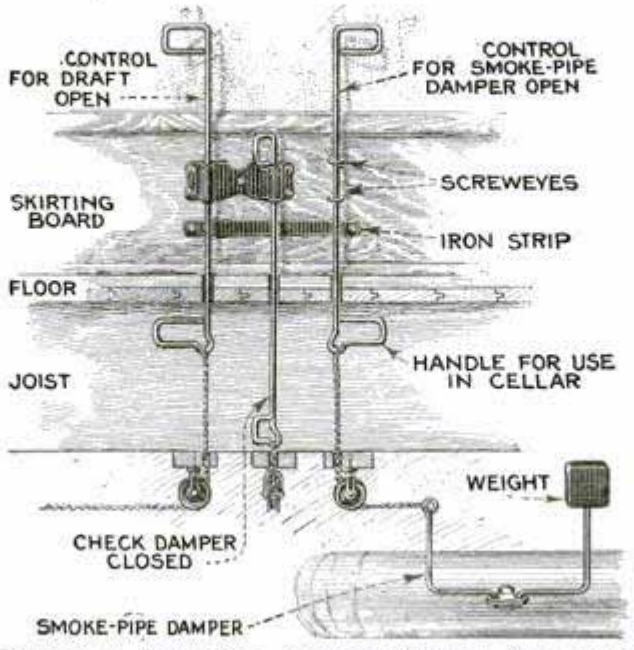
is masked with a piece of paper cut to the desired shape. The board is placed on its edge and the paper spattered with water color thinned to liquid form. The spattering is best done with a fixative atomizer. An old toothbrush and knife can be used if no atomizer is available. The spattering is continued until the surface is almost completely covered.

When the water color is dry, the edges of the paper segment are brought together and firmly glued. The wire frame is placed inside the cone thus formed, and thick glue spread on the top and bottom wires. The edges of the paper are then turned in over the wires and the shade placed on a table and weighted down until the glue is perfectly dry. When dry, the edges of the paper inside the shade are trimmed off with a knife. This method of fastening the paper to the frame will result in a very neat job.

The shade is now ready to receive its final decorating and varnishing. Silhouettes painted on the shades with black india ink show up very nicely whether the lamp is lighted or not. Almost any design looks good if carefully arranged. Landscapes, sea scenes, birds, flowers, girls' heads, etc., can be used to decorate the shades. When this work has been completed, the entire shade is given a coat of clear varnish. This can be applied with a fixative atomizer or, if this is not available, with a soft brush.

Controlling Furnace Dampers

The check and draft dampers of most home furnaces are controlled by means of chains attached to them and run over pulleys and up through the floor to a bracket on the baseboard in the room above. It is often convenient to work these dampers from the basement but this is usually impossible if the chains are securely fastened above. The simple arrangement shown in the illustration provides control of the dampers from either the furnace room or from the usual place above. When the chains are down as far as they will go so that the dampers are closed, the upper ends of the chains should just pass the pulleys as indicated. The ends of the chains are attached to lengths of galvanized-iron wire, or light iron rods, about ⅛ or 3/16 in. in diameter. One end of each wire is first bent into a ring for a finger grip. This ring should be formed so that it will stand out from the wall. The wires are then pushed down through the chain bracket and the holes in the floor, until the rings rest on the bracket. Enough wire is left below the floor to reach the ends of the chains and to be bent as indicated to form small handles. The wire not needed is cut off and the chains attached to the handles. The dampers can then be manipulated either from below or above by push-



Method of Controlling Furnace Dampers from Positions Above and Below

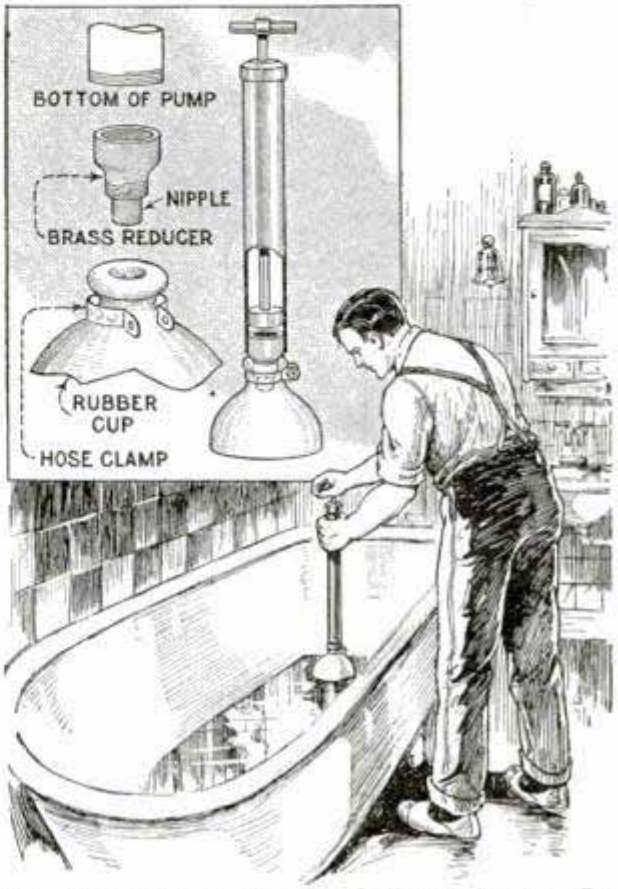
ing and pulling the wires. In order to hold the dampers in the open position, it may be necessary to fasten an iron strip to the baseboard either above or below the chain bracket, so as to hold the wires firmly. There is spring enough in the lengths of wire to permit them to be moved up and down, and still hold the dampers in any position desired. If there is a choke damper in the smoke pipe, it may be similarly controlled. A stiff wire is run through the handle of the choke damper, securely fastened to it and then bent at right angles about 4 in. from either end. To one arm thus formed a weight is attached and a chain is fastened to the other arm. The chain is run over pulleys to a control wire passing through the floor, similar to those on the check and draft dampers. However, as there are usually only two channels in the chain bracket on the baseboard, means must be provided to hold this last wire in any position. A couple of screweyes, driven into the baseboard, and the iron strip, previously mentioned, work well. If the old chain bracket is not suitable for the other wires, screweyes will be found satisfactory here too.

Ball-Peen Hammer Used for Winding Wire Tightly

In splicing two pieces of wood together, using wire binding, a smooth job can be done in a very workmanlike manner as follows: A tight, even winding will be obtained by slipping the ball of wire over the end of a ball-peen hammer, as in the sketch, and passing the wire around the head of the hammer and the object being spliced, in the manner shown. The greater number of turns around the hammer, the greater the tension, while, inversely, fewer turns will lessen the strain.—Robert Gregg, New York City.

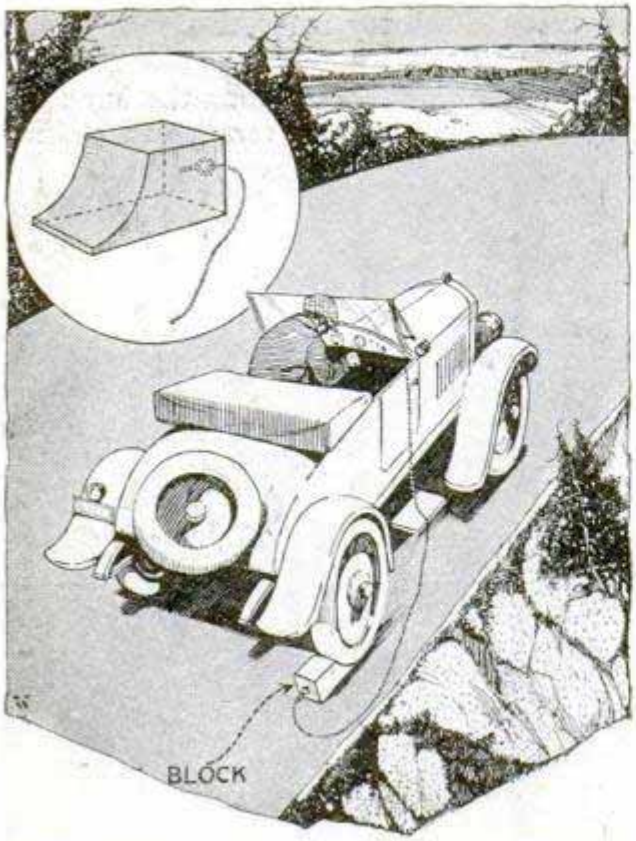
Putting Efficiency into the Drain Cleaner

Under normal conditions the hand suction drain cleaner will remove an obstruction without much trouble. But if it does not, because the drain is clogged too tightly the emergency can be met in the following manner: Unscrew an automobile pump cylinder from its base and clean the bottom opening and edge with emery paper. Attach a brass reducing coupling, the large end of which will make a snug fit inside of the pump tube and the other a tight fit inside of the small end of the usual rubber suction cup. Sweat the coupling into the pump with solder to make an air-tight joint. Cut out the bottom of the recess in the top of the cup so that the opening goes clear through. Insert the small end of the coupling and clamp it tightly with a pipe clamp. This completes the drain cleaner, and almost any obstruction can be removed by a few strokes of the piston. —L. B. Robbins, Harwich, Mass.



Auto Pump Combined with Ordinary Suction Cup Easily Removes Stubborn Obstructions in Drain Pipe

¶Black stains from eggs on silverware will disappear at once by rubbing with salt; so it is a good idea to keep a salt cellar handy on the kitchen sink.



Block-and-Cord Equipment for Autos to Permit Easy Starting on Steep Grades

Block and Cord for Parking on Hills

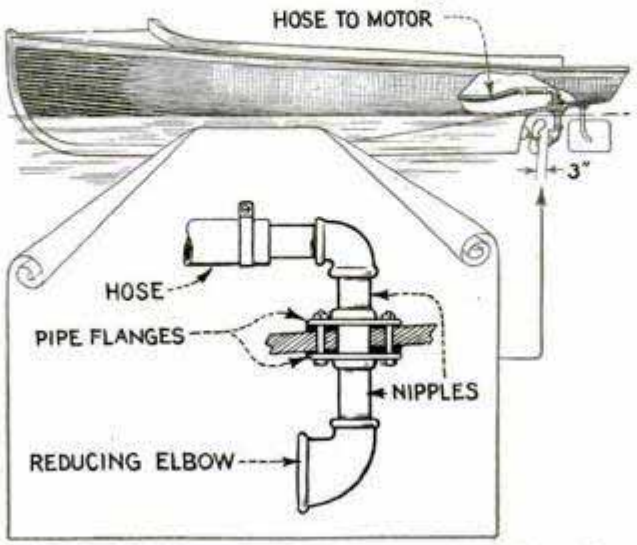
Every motorist who has had occasion to change a tire or make repairs while parked on a steep hill, knows that stopping and getting under way again often is difficult and sometimes dangerous. The conventional practice is to block the wheels with a rock, perhaps leaving the rock in the road for other motorists to bruise tires on. The writer has solved this problem by the use of the block-and-cord equipment shown in the illustration. With this, I can stop on a steep hill and block the car so that there is no possibility of its backing down. When ready to leave, I start in low gear and take the block with me. To avoid the possibility of scratching the car when putting the block in, I cover it with a few scraps of old carpet. It may bump the side but no damage will result.—J. E. Hoag, Los Angeles, Calif.

Keeping Putty in Good Condition

When mixing putty, use a large-bladed putty knife and mix a considerable quantity of the material at once, as it improves with age. As linseed oil is added, pound the mass on a mixing board to eliminate excessive moisture. This also toughens the product and renders it more elastic. Do not make it too dry. When thoroughly mixed, put the putty in a can or jar, which can be tightly sealed, and cover with water so that it will keep indefinitely. To keep putty overnight or for a number of days when it is being used, wrap it in an oil-soaked paper at the end of each day's work. It will always be found fresh and soft the next morning. A mass of putty that has been allowed to harden can usually be renewed in the following way: Break up the mass into small pieces with a hatchet or chisel. Put them into an iron kettle with enough water to thoroughly cover them and place over the fire to boil, stirring constantly. Add a little raw linseed oil when hot. The putty will quickly absorb the oil, after which the water can be poured off, the putty removed and easily worked into shape, and it will then be found to be as good as new.—L. B. Robbins, Harwich, Mass.

Water-Circulation System for Motorboats

A good system of water circulation for motorboats used in fresh water is shown in the drawing. It forces the water through the engine jacket, insures proper cooling, and does not entail the troubles experienced with plunger or rotary pumps ordinarily used. It consists of a few pipe nipples, a reducing elbow, a couple of pipe flanges, another elbow, a length of hose and some bolts. The detail of the illustration shows the arrangement clearly, the intake being located just behind the propeller, which forces



Propeller Used to Force Water through Circulation System of Motorboat

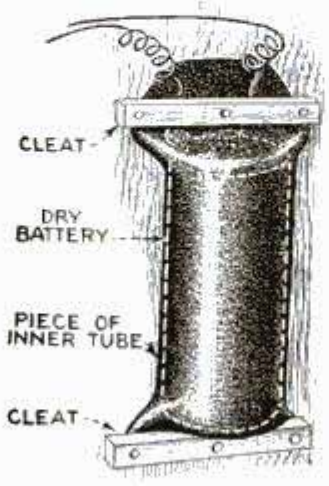
the water through the system. The hose is connected to the motor, and the water, after passing through the motor jacket, is discharged overboard.—K. M. Moreland, Monterey, La.

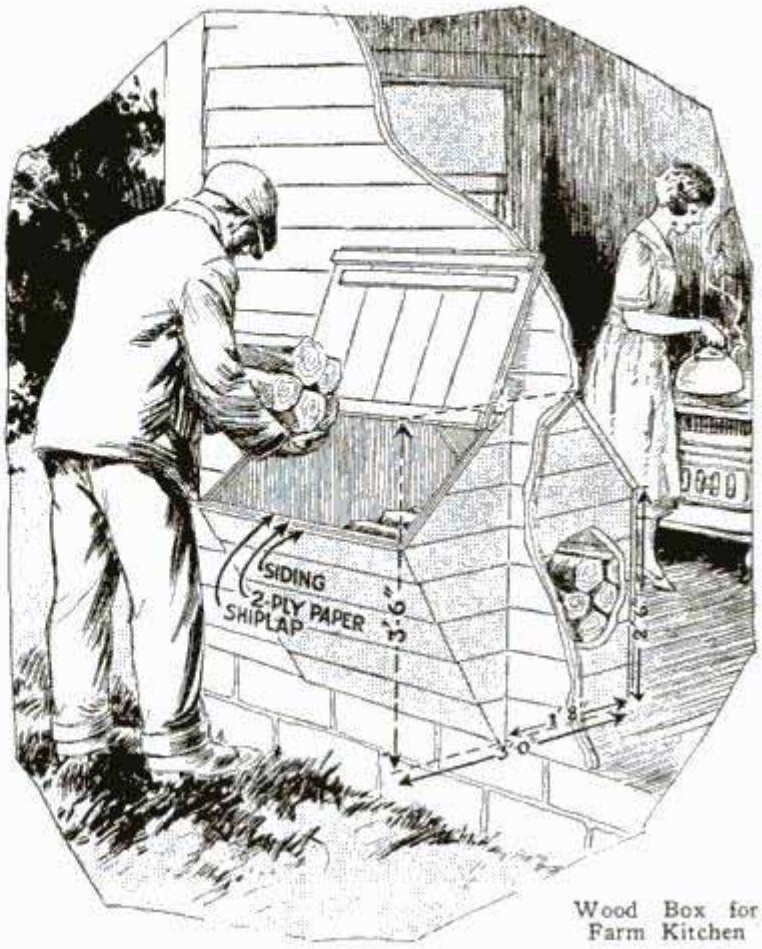
Rubber Cement Fastens Tracing Paper

When a large drawing is to be traced only in a certain portion, it may mean that thumbtacks are needed to hold the tracing paper in place, and then small holes will be left in the drawing, which is, of course, not desirable. Instead of tacks, rubber cement will serve the purpose, as it does not leave any marks or stains on the drawing. Squeeze out a little of the cement at points around the portions to be traced, on both the drawing and the tracing. Spread the cement smoothly and allow it to dry. Then lay the tracing paper on the drawing and press it down firmly. Make the tracing and remove the paper. The dried cement will gradually peel off and curl up and can then be dusted away. No marks will be left.

Practical Method of Hanging Dry Cells

Finding a good location for a dry cell is sometimes a puzzling job. A method of hanging, which avoids the necessity of nailing up cumbersome supports, is shown in the drawing. The end of a short piece of old inner tube is securely tacked to the wall with a cleat. Dropping the cell with the wires connected into this container and cleating it at the top completes the job. By drawing the tube up snugly before nailing the top cleat, the cell will be held securely. This arrangement takes little space and provides adequate protection.





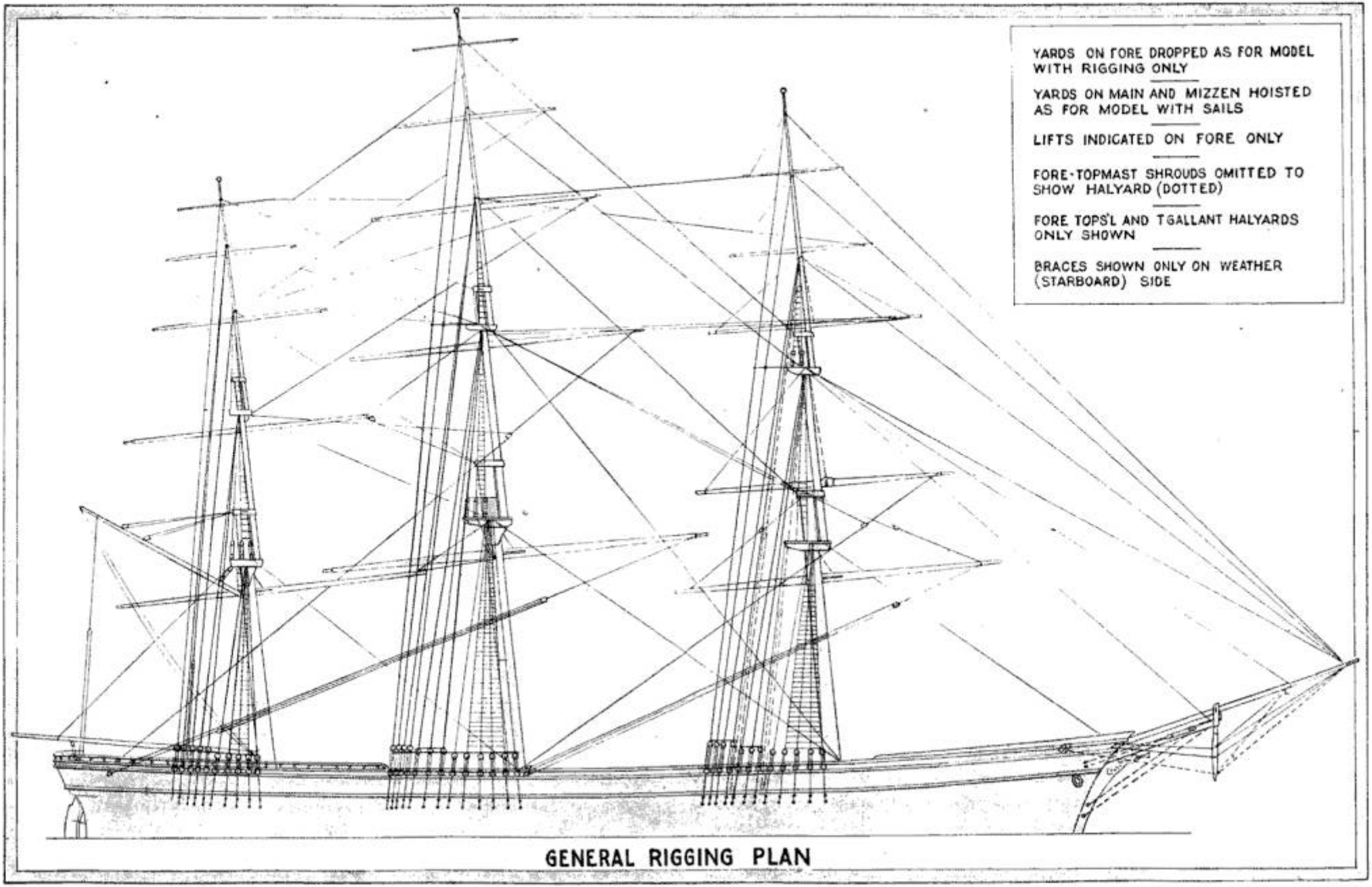
Wood Box for Farm Kitchen

Wood Box for the Farm Kitchen

Considerable dirt is brought into the house on the boots of those carrying the daily supply of wood into the farm kitchen. However, the trouble can easily be prevented by installing a wood box of the kind shown in the drawing. Besides, it is handier for those whose duty it is to fill it. It is built partly in and partly outside of the house, ship-lap, 2-ply building paper and siding being used in its construction. The drawing shows how it is made and gives the dimensions. A piece of old inner tube is tacked along the top over the hinges to prevent rain from dripping in.—P. H. Ashby, Alberta, Can.

Blackening Shoes without Dye

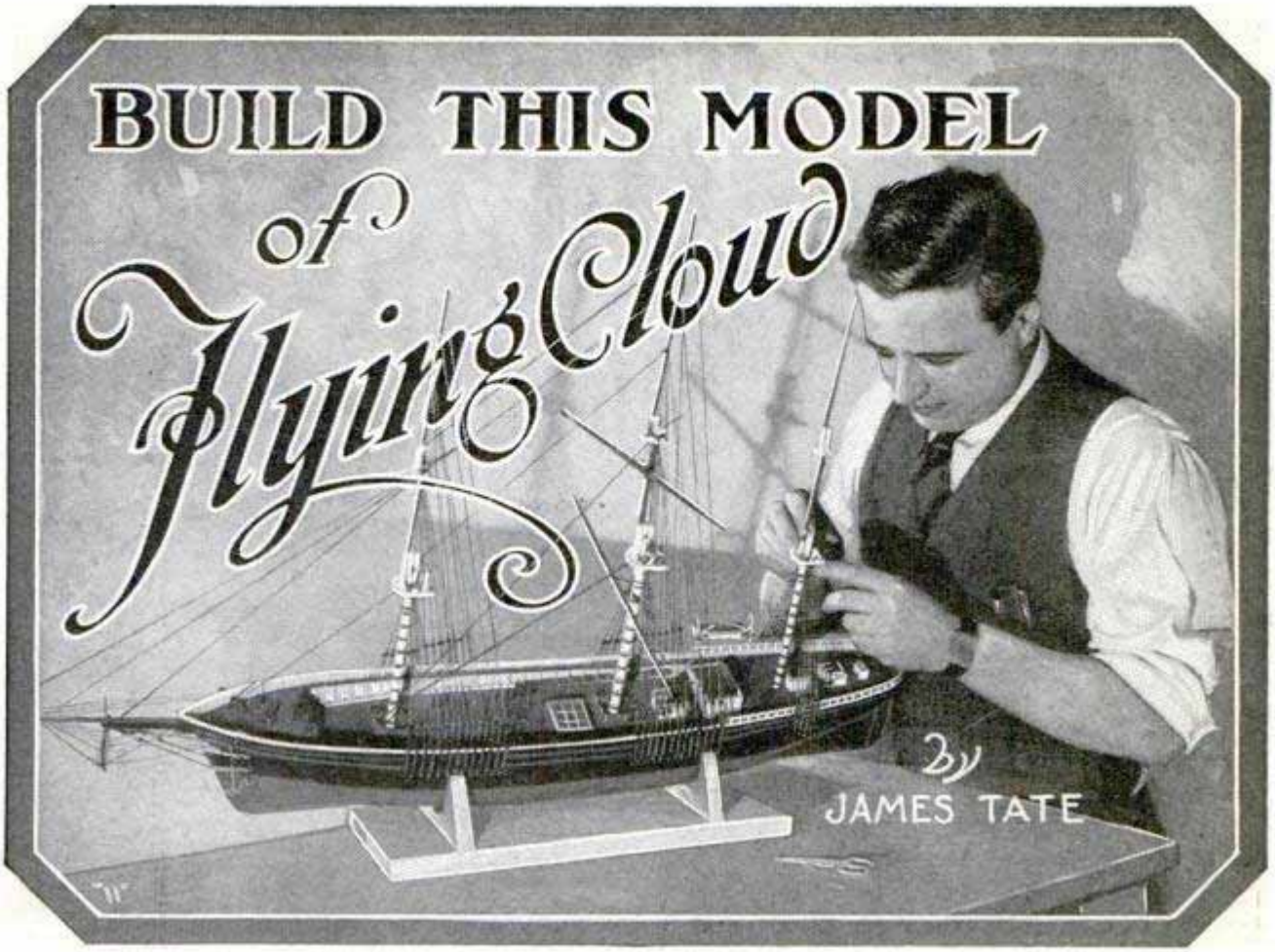
Suede-leather shoes can be blackened without the use of dye by rubbing some pulverized charcoal into the leather with a soft cloth or a piece of felt. The felt will work better if it is not too thick. This method will save many pairs of shoes that are too good to throw away. If a little care is taken in the application of the charcoal, the finish will be permanent.



GENERAL RIGGING PLAN

Part 6

BUILD THIS MODEL of Flying Cloud



THE job of fitting the standing rigging is now in order. This rigging supports the masts, as distinguished from the running rigging for handling the yards and sails. The masts are supported athwartships by ropes called shrouds, and in a fore-and-aft direction by stays on the forward side and backstays on the after side. It is best to rig the main and maintopmast first, so that the fore shrouds will not interfere with the fitting of the stays of these masts later on.

You will need three sizes of rigging line, one hank each of heavy, medium and fine. The heavy is known as No. 18, nine-ply white-brown Jacquard cord, the medium No. 25, six-ply, and the fine No. 80, six-ply; all are obtainable from ship-model supply houses. These are linen cords, and nothing else should be used for rigging; cotton shrinks and stretches too much with changes in the atmosphere. Get also a spool of black linen button thread, one spool each of No. 30, 36 and 60 cotton, one spool of No. 28 black-iron wire and one of No. 32 tinned-steel wire. Since all the standing rigging is black, it will be necessary to stain or dye the linen cord, and for this either black dye or aniline black dissolved in alcohol can be used. When the dye is set, draw the cord through a cake of paraffin or beeswax, and wipe it down with a cloth. This moisture-proofs the cord. Two shrouds are formed on one side of

SHIP-MODEL PRIZES

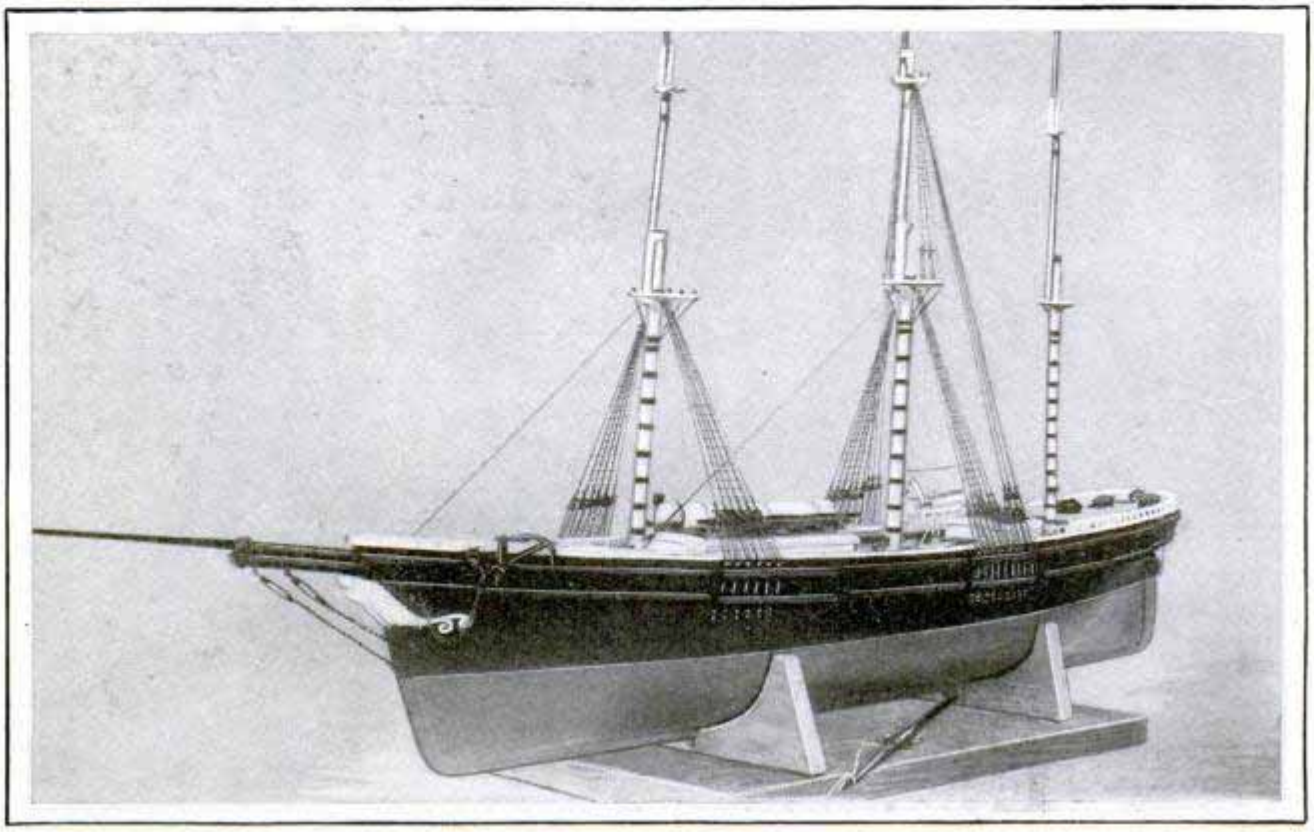
FEW hobbies enable the amateur to produce such beautiful work with so few tools and such inexpensive material as ship-model building. To encourage such a worth-while and pleasant pastime, Popular Mechanics Magazine offers the following awards for the best models of the "Flying Cloud" made from this series of articles, the first of which appeared in the Dec., 1927, issue.

First, $100 cash and gold medal.
Second, $50 cash and silver medal.
Third, $25 cash and bronze medal.
Five awards, $10 cash and bronze medal.
Five awards, $5 cash and bronze medal.

Bronze medals also will be awarded for excellence in workmanship.

The contest is open to everyone, regardless of age or sex. The conditions are very simple, and full details will be supplied to every reader addressing the Editor, Amateur Mechanics department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.

the mast from one length of cord by passing it through the lubber's hole in the manner shown in Fig. 100, bringing it down again through the same hole and seizing it together as indicated. The shrouds are tightened, or set up, by means of deadeyes and lanyards. For the lower shrouds on all masts use the coarse cord, 3/16-in. deadeyes and waxed button-thread lanyards. Lead the forward shroud on each side down even with the center line of the mast, Fig. 101; make a mark in the channel and drill right through both channels for the No. 28 black wire. A deadeye is fastened in a wire eye as shown (Fig. 100), the wire is passed through the holes in the channels, then a small eye is formed on the end of the wire ½ in. below the channel and this end fastened to the hull with a "lill." These small pins will be found to drive perfectly if a leading hole is made with a fine needle drill and the point of the pin is cut off. A backing link, made of the same wire, should go over the end of the wire "chainplate," as indicated at A, Fig. 100, but it will be found much easier to form chainplate and backing link in one piece, as shown at B and C. A deadeye is turned into the end of the shroud as shown, making the distance between the two deadeyes 1 in. It will be easier, however, to serve the turned-up end of the shroud as one wraps a baseball-bat handle, than to make three separate lashings as shown. Make the turned-up end ½ in. long, and serve with No. 60 cotton. Get a tube of LePage's glue, squeeze a little out into a saucer, dilute it with an equal quantity of water and apply to the serving with a small brush. Follow this procedure with all knots and lashings, and they will not open up when the ends are cut short. Put on the forward starboard shrouds first, then the forward port pair, then the next pair aft on the starboard side, and so on. Keep the upper deadeyes in a straight line, as in Fig. 101, and space the deadeyes evenly along the channels. The manner of fitting the lanyards is shown in Fig. 101; be sure to keep the odd hole in the upper deadeye at the top and in the lower deadeye at the bottom. On the starboard side, the knot on the inside is back of the forward hole and the lanyard is rove aft; on the port, the knot is at the after hole and the lanyard is rove forward. Make the turned-up ends of the shrouds all the same length, and keep them at the right, looking inboard. When the shrouds are finally set up, tuck the end of the lanyard between the parts of the shroud as shown,



pull tight, apply a touch of glue, and, when dry, cut off close.

A good pair of tweezers is indispensable when setting up the lanyards and for similar work around the rigging. Be careful to keep all the masts perfectly in line when setting up, tightening and slackening the shrouds on each side until they are so. There are six shrouds on each side on fore and main, and five on the mizzen. The odd shroud on the mizzen can go straight over, forward of the lower mast. It is best to have the topmasts in place when fitting the lower shrouds. After all the shrouds have been placed on the main and set up, lash them all together just under the top, so that they will line as nearly even as possible, then set up the mainstay. This is double, of the coarse cord, passed around the masthead to make a loop like the maintopmast stay in Fig. 107, and set up to eyepins driven into the tops of the fore bitts. The upper ends of the fore, main and mizzen stays go between the crosstrees, but the upper ends of the fore, main and mizzen-topmast stays go outside the crosstrees.

Next set up the maintopmast shrouds, three on each side, from the crosstrees to the topmast head, using the medium cord,

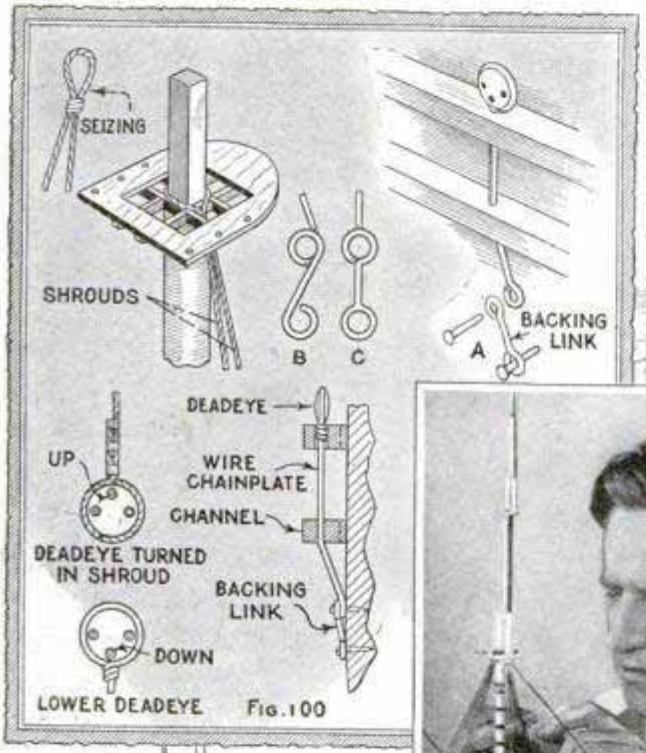


Fig. 100

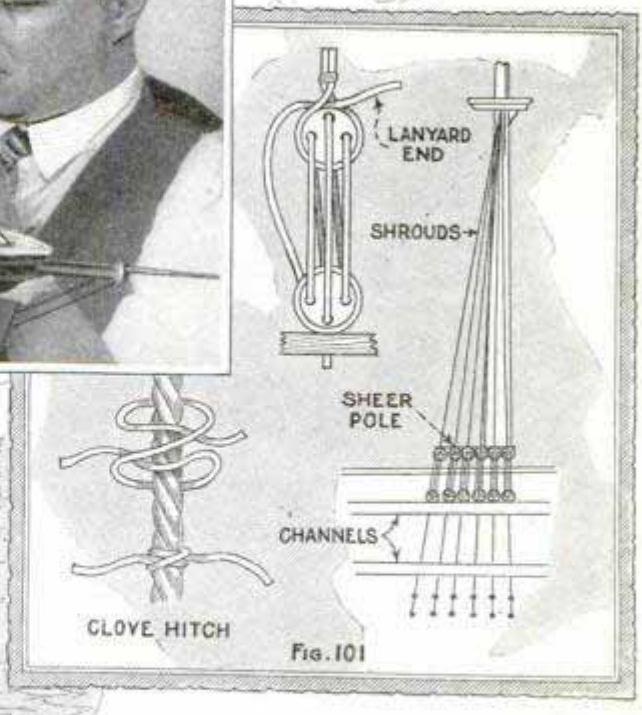
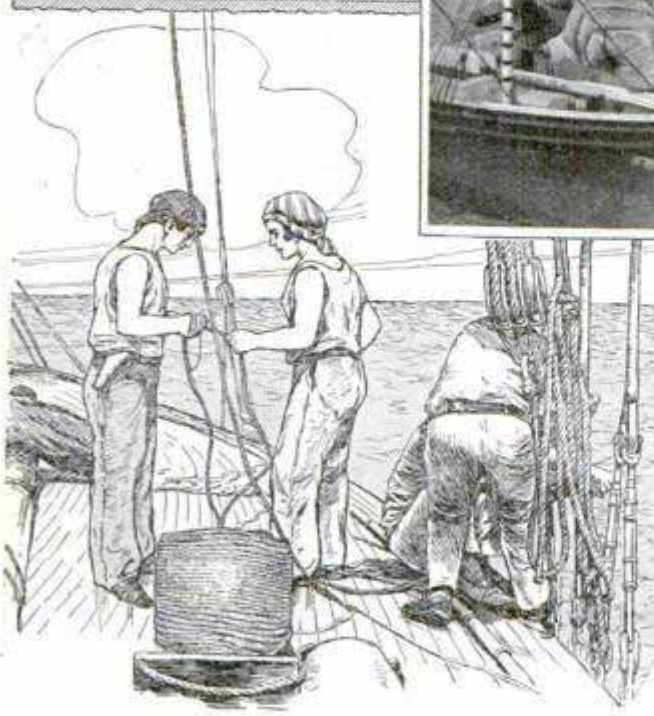


Fig. 101

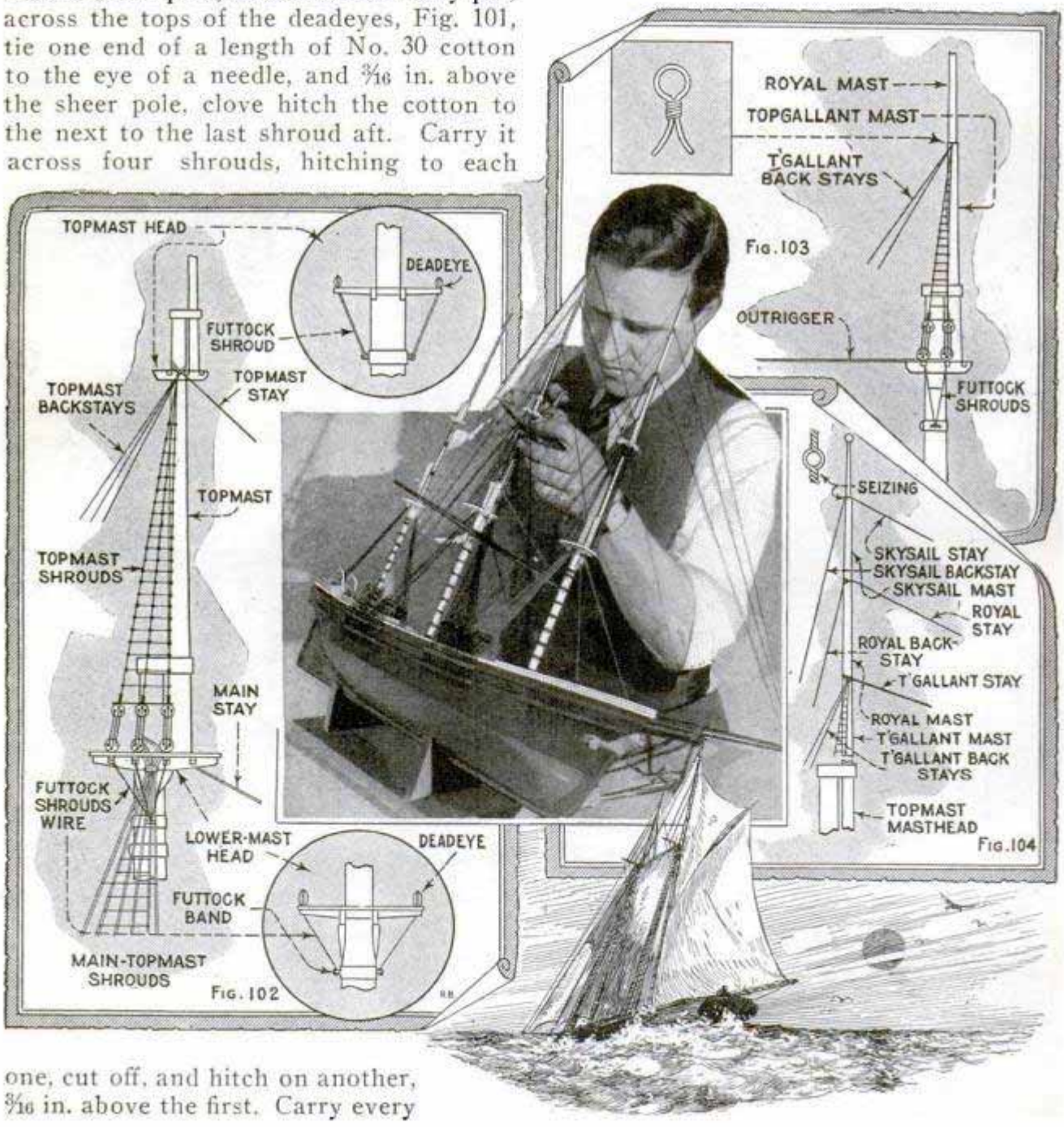


⅛-in. deadeyes and No. 60 cotton lanyards. These are fitted in exactly the same manner as the lower ones, but

the distance between the deadeyes is ½ in. The futtock shrouds are of the No. 32 wire, fitted as in Figs. 102 and 105, and painted black. With these in place, fit the topmast backstays, three on each side (see Fig. 106), and finally the single topmast stay, all of the medium cord. Note that the upper deadeyes for the backstays are a trifle higher than those on the shrouds. The maintopmast stay is doubled and goes to a cleat on the foremast 1 in. above deck. (See Fig. 107.)

It is well to "rattle down" the lower and topmast shrouds before setting up the backstays. The ratlines are the ropes that cross the shrouds to form ladders. Lash a sheer pole, made from a heavy pin, across the tops of the deadeyes, Fig. 101, tie one end of a length of No. 30 cotton to the eye of a needle, and 3/16 in. above the sheer pole, clove hitch the cotton to the next to the last shroud aft. Carry it across four shrouds, hitching to each one, cut off, and hitch on another, 3/16 in. above the first. Carry every fifth ratline across all six shrouds. Rattling down must be done carefully if it is to look right and it is a rather tedious job, but practice soon develops a technique that makes it comparatively simple. Where the shrouds converge, a simple overhand knot may be used instead of the clove hitch, but the latter is the better lower down. Leave the ends of all the cottons long, secure all knots with thin glue, then, when this is dry, cut the knots off close with a pair of manicure scissors. The ratlines on the topmast shrouds are No. 36 cotton.

The fore and mizzen are then rigged in the same way. The ratlines on the mizzen run across three shrouds, every



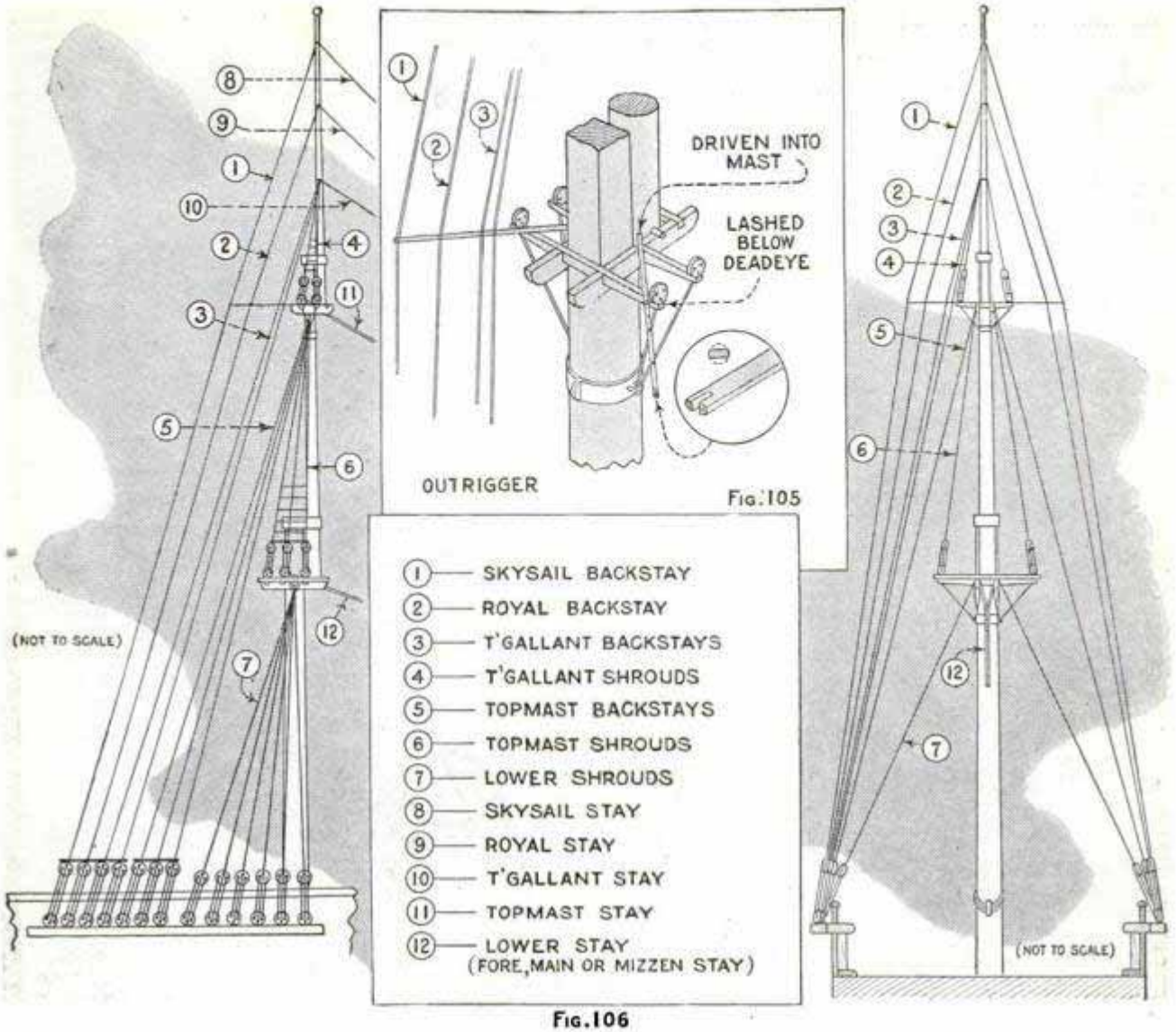


Fig. 106

fifth one, as before, being carried clear across. The doubled forestay, of coarse cord, runs down to two eyepins behind the knee on the foc's'le deck, as in Fig. 107, and the doubled mizzen stay to a cleat on the mainmast. The foretopmast stay runs doubled down to the bowsprit. Just above the bee seat the parts are seized together, then each "leg" is carried through a hole in the bee seat (see Fig. 110), a ⅛-in. block is turned in the end, a similar block is hooked to an eyepin straight aft on the bow, and the stay set up with this tackle, on each side.

Two other stays go to the foretopmast, the jibstay and outer-jib stay, Nos. 4 and 5 in Figs. 108, 110 and 112. The single jibstay, medium cord, goes down through a hole in the jibboom at the first stop or shoulder, down under the upper hook on the starboard side of the dolphin striker, and it is set up to an eyepin in the bow, under the cathead and between the moldings. The single outer-jib (see Fig. 110) stay, medium cord, goes through a hole at the outer stop on the jibboom, under the upper port hook on the dolphin striker, and to a similar eyepin on the port side. To keep the dolphin striker from swinging sidewise as these are set up, it is well to fit the whisker boom first. This is a 2⅞-in. length of 1/16-in. brass wire, driven through a hole in the bowsprit cap as in Fig. 110. File the ends flat and drill No. 60 holes through them, as in the insert, Fig. 110. File flat and drill three more holes on each side, ¼ in. apart, and fit the boom in place. Fit the guys, of 20 or 22-link chain, and the stays then can be fitted without the dolphin striker swinging. Paint boom and guys black.

The next step is to set up the topgallant shrouds, backstays and stays, using the medium cord on the fore and main, and the fine on the mizzen. There are two shrouds on each side, set up with ⅛-in.

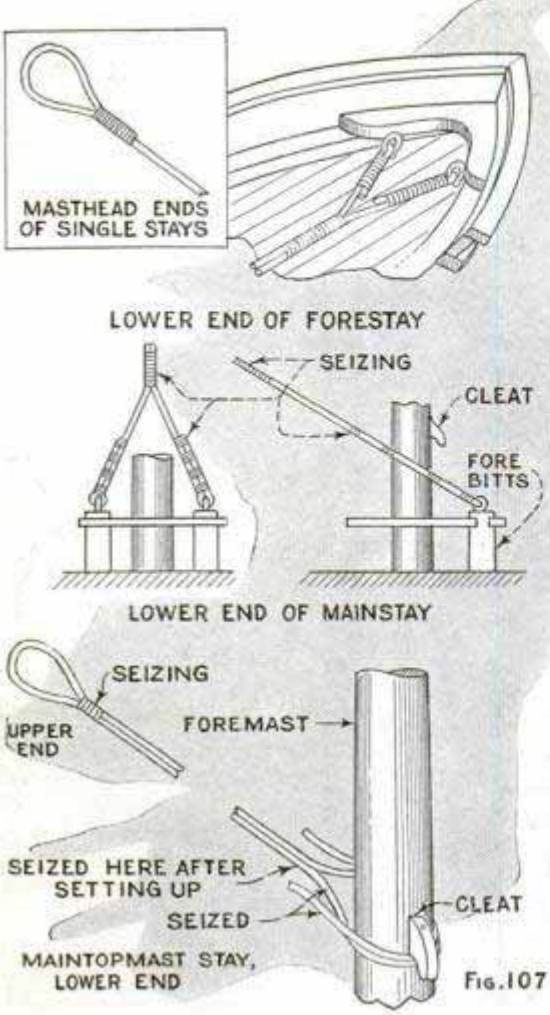


Fig. 107

deadeyes. Use No. 60 cotton for the ratlines, and rattle down before fitting backstays. The topgallant stays are single, and the way they lead is shown in Fig. 108. Where stays run to a masthead, an easy way of fitting them is shown in Fig. 109. Knot the end of the cord, pass it up through a hole in the crosstree, then through an eyepin at the masthead and up to its mast. If the mast cap is of metal, set the eyepin as at B. Be careful in setting up stays and backstays that the upper

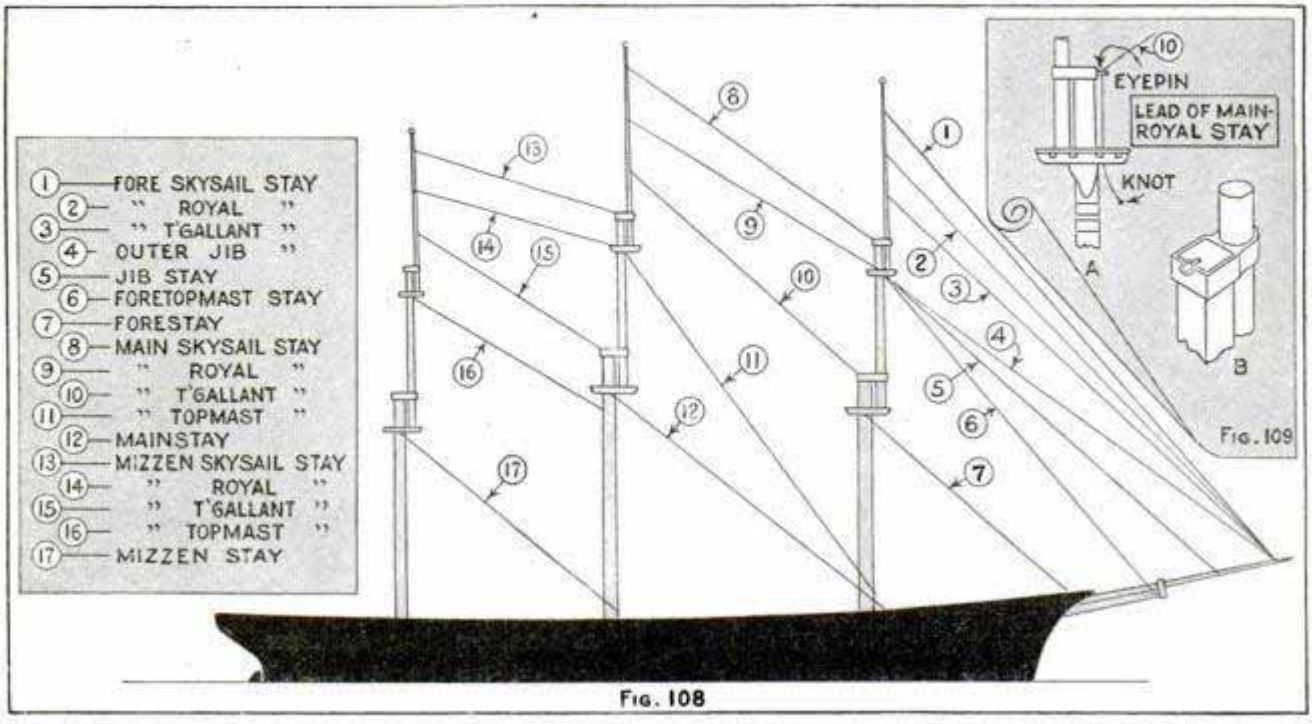


Fig. 109

Fig. 108

masts are not bent back or forward out of a straight line with the lower masts. By judicious handling of the rigging, the masts may be made to assume any rake necessary.

The foretopgallant stay goes down through an eye at the outer end of the jibboom, under the lower starboard hook on the dolphin striker (No. 3 in Figs. 108 and 110) and up to an eyepin in the bow just below the jibstay. The foreroyal stay, No. 2, leads in the same way under the lower port hook on the dolphin striker to an eyepin in the bow under the flying-jib stay. The foreskysail stay, No. 1, is seized to the royal stay just under the jibboom. All the last three stays are of the fine cord.

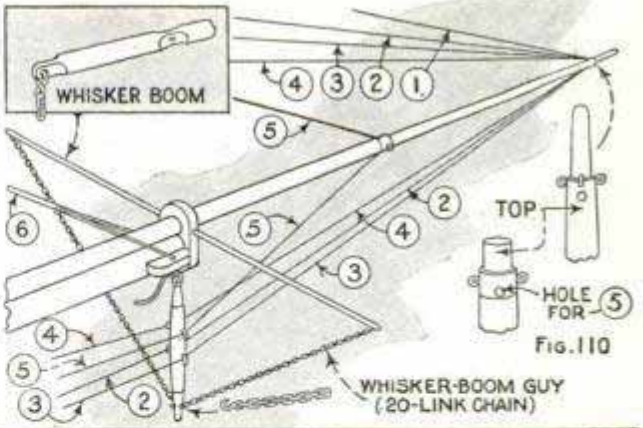


Fig. 110

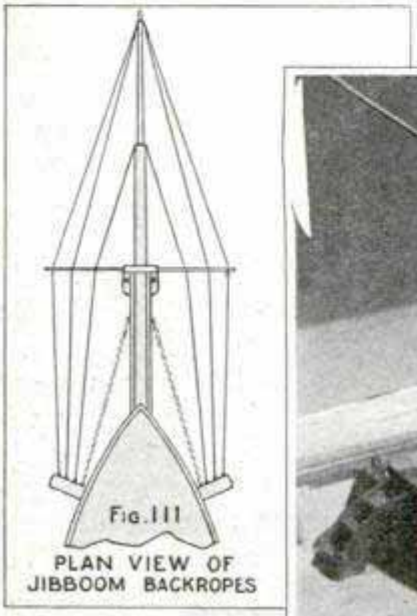
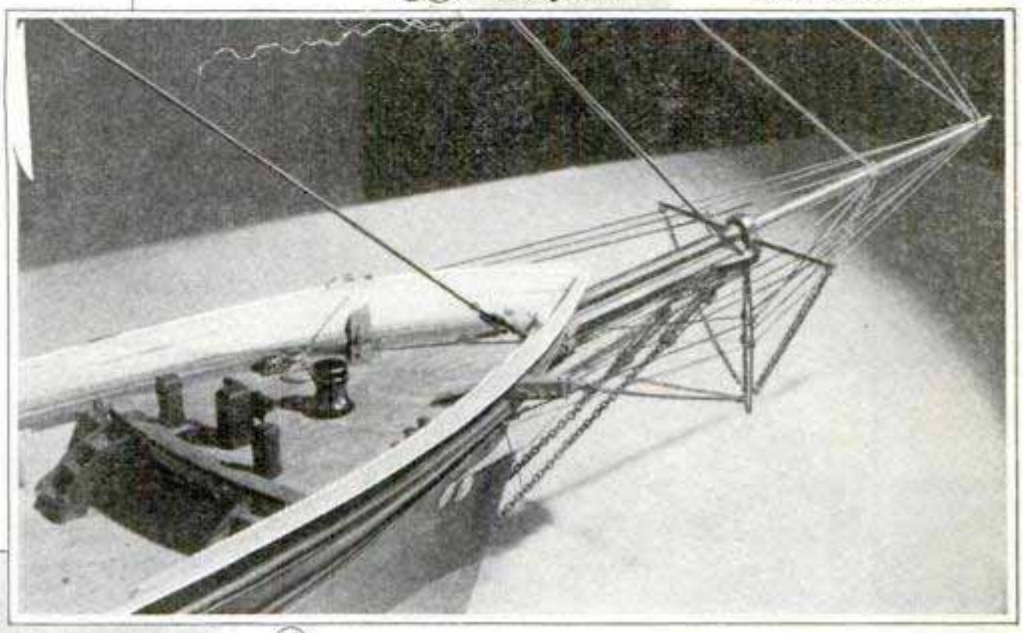


Fig. 111
PLAN VIEW OF JIBBOOM BACKROPES



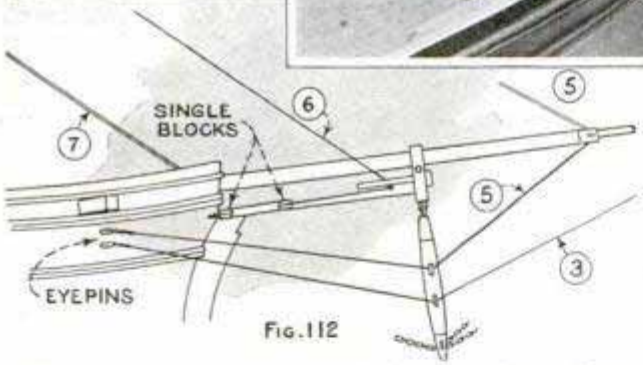


Fig. 112

The jibboom backropes, Fig. 111, are of the fine cord or the button thread, and are rove, as indicated, from the jibboom through the holes in the whisker boom, and set up to eyepins in the forward sides of the catheads. This completes the head standing rigging.

The topgallant backstays on fore and main, two on each side, are of the medium cord. On the mizzen there is one topgallant backstay on each side, of fine cord. The royal and skysail stays and backstays, on all masts, are of the fine cord. When fitting single backstays, as on the royal and skysail masts, the neatest way to do it is to open the cord by untwisting in the middle of the length, slip the eye thus formed over the mast and down to the shoulder, then apply a touch of thin glue and seize the cord on each side of the mast, as indicated in Fig. 104. The masthead ends of single stays are treated as in the detail, Fig. 107.

Lash sheer poles made of stout pins to the backstays as in Fig. 106, and paint black. Lash smaller ones to topmast and t'gallant shrouds. The outriggers for the t'gallant, royal and skysail backstays, detailed in Fig. 105, are made from 1/16-in. wire, filed down flat on two sides. Those at fore and maintopmast crosstrees are 2 in. long, pointed at one end, slipped under the shrouds and into the t'gallant masts, then lashed to the after deadeyes. Before fastening in place, set them in po-

sition, mark where the backstays will cross them, then file small notches in the outboard sides of the outriggers to retain the backstays. The notches for the backstays should be so placed that the stays will have to be pulled back a trifle to enter them. The skysail backstays fit into notches filed in the ends. (See Figs. 105 and 106.) The mizzen outriggers are 1¼ in. long. Paint the parts on top of the crosstrees white and the outer parts black, lash the backstays in the notches with a single turn of No. 60 cotton, and apply a touch of glue to each notch and knot.

Study all the drawings and directions carefully before starting to work, and be sure of each step in advance. Some may prefer to set up the lower rigging on the mizzen first, as this makes it easier to fit the mizzen stay. If the deck house has been fitted so that it can be lifted out, it will be found a help to remove it while fitting the main and maintopmast stays.

A blueprint of the general rigging plan is available, price 25 cents postpaid, from the Amateur Mechanics department, and will be found of help while rigging.

(To Be Continued Next Month)

Short Length of Tape Prevents Danger of Baby Climbing and Falling from High Chair

Preventing Baby Falling from High Chair

We have been experiencing considerable trouble from our fifteen-month-old girl climbing up in the high chair and sitting on the tray. A number of times she almost fell, and it was necessary to find some method of preventing this. By attaching a string or tape just below the seat and making a loop to slip over the foot so as to prevent too much movement, but at the same time permit enough for comfort, we successfully overcame the trouble and can now leave her in the chair and feel sure that she will not fall out.—F. A. Inman, Grand Rapids, Mich.

Washing Chintz without Loss of Gloss

The proper way to wash chintz so that it will not lose its gloss is as follows: Boil 2 lb. of rice in 2 gal. of water. When cool enough to immerse the hands, plunge the chintz into the mixture, rubbing it with the rice and water until the dirt has disappeared. Then boil a like quantity of rice again in the same amount of water and drain the water from the rice. This is the rinsing water. The chintz should be dried as flat as possible and ironing of this material should be done with a medium-heated iron.—L. H. Georger, Buffalo, N. Y.

Razor-Blade Knife

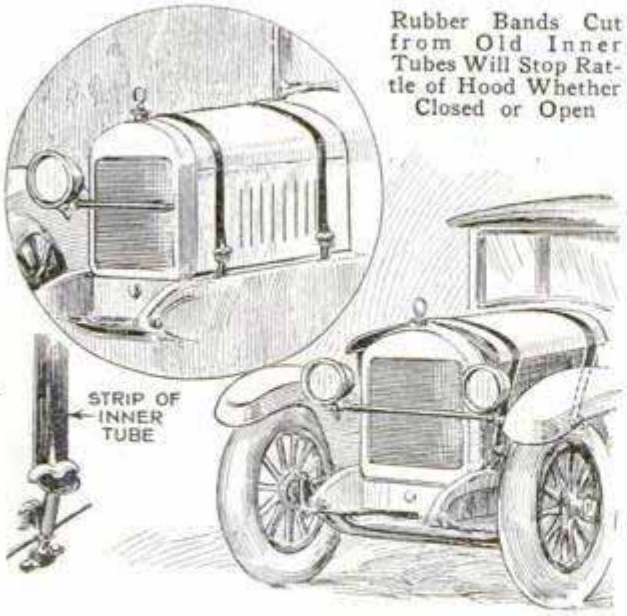
It is sometimes necessary to cut paper by means of a sharp knife. An ordinary safety razor can be used for this purpose, as shown. In the absence of a special holder, the razor is taken apart and the blade is inserted so that it is held by the center and one end pin. Of course, one must be careful when using the blade in this way. Being flexible and brittle, it is likely to break off if too much pressure is applied, and this means the possibility of cutting one's fingers severely. Do not attempt to use this knife on cardboard, as this will surely damage it. The blade is only suitable for use with thin paper, cloth, and the like.—Lindley Pyle, St. Louis, Mo.

Non-Slipping Diving Board

Here is a way to add safety to your diving board and fun to your swim. Make sure that the diving board is thoroughly dry; then apply two coats of white lead and oil, giving each coat enough time to dry. Dissolve a good quantity of white lead in varnish. This mixture should be thick and sticky, and drier should be added in the proportion of one-half cupful to each gallon of paint. Paint the board with this mixture. When nearly set, sprinkle clean silica sand over the surface. Get a rolling pin or a pipe and roll the sand in well, adding sand until the surface will take no more. Then leave it to dry. The result will be a spring or diving board which will never be slippery.—W. H. Leach, Cleveland, Ohio.

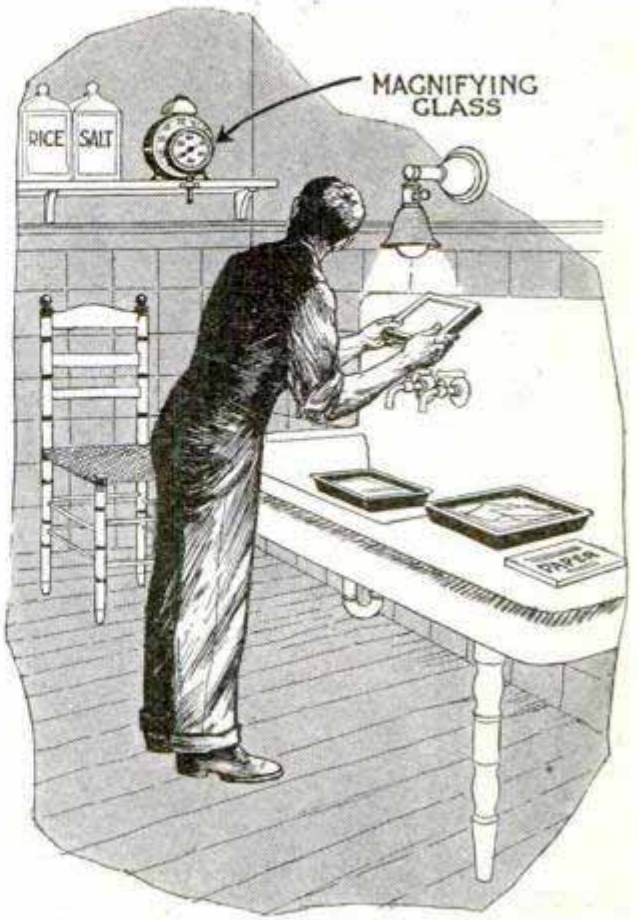
Rubber Bands for Hood Straps

Auto hoods on light cars and trucks often develop an annoying rattle which is difficult to overcome. Two long bands cut from an old inner tube and stretched over the hood, as shown in the insert, will remedy the rattle. If the bands are cut evenly and placed symmetrically on the hood, they will not detract from its appearance. It is often desirable to open the sides of the hood to permit better cooling of the motor,



and then the rubber bands will hold the hood in the open position.

¶Chamois skin may be cleaned by soaking it in soda and water, and then in soapsuds.



Reading the Second Hand and Dial of a Clock from a Distance by Means of a Magnifying Glass

Reading Second Hand of Clock at a Distance

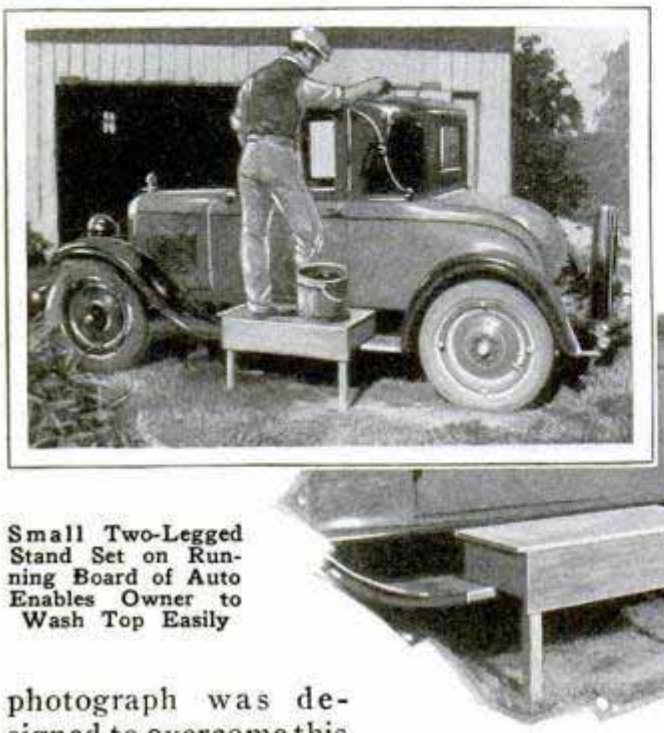
A few seconds more or less means much in the exposure of sensitive paper to artificial light in photography. When it is inconvenient to have a watch or a clock near enough to be easily seen, the idea shown in the accompanying drawing can be used to advantage. In front on an ordinary alarm clock and at the proper focusing distance, a reading glass is attached to magnify the second hand and the dial. In the home where this is used the clock is kept in its accustomed place on a shelf and the glass is attached to the edge of the shelf. In this way the second hand can even be seen quite easily from the other side of the room.—Harry Moore, Hamilton, Ontario, Can.

Using Oil Stain

When staining hardwoods, pour the quantity of oil to be used into a separate container and add to it approximately one-eighth of the amount in varnish. This mixture provides a good undercoat, if the article is to be given a wax finish.

Platform for Washing Auto Top

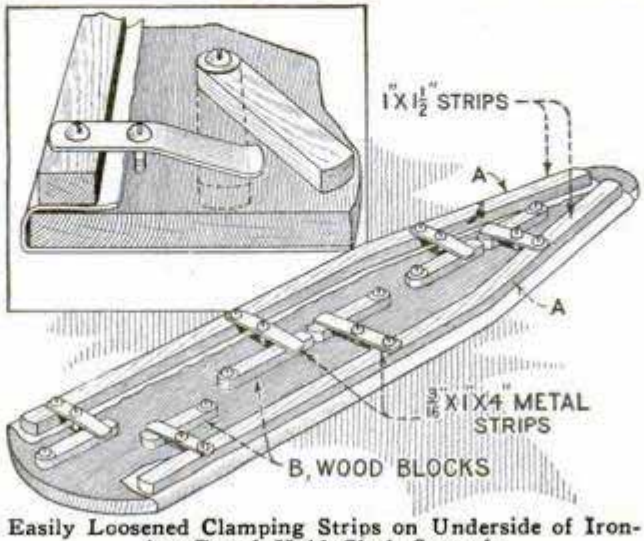
When the auto owner washes his car, he finds it rather difficult to reach the center of the top. The platform shown in the photograph was designed to overcome this difficulty as well as make the job easier generally. It is about 3 ft. long, 15 in. wide and 20 in. high, being like a table with the exception that it has only two legs. The back part of the stand rests on the running board of the car and the top is about 7 in. higher than the running board.—Irvin L. Oakes, Pleasant Hill, Ohio.



Small Two-Legged Stand Set on Running Board of Auto Enables Owner to Wash Top Easily

Cloth Clamp for Ironing Board

A positive device for holding the ironing cloth tight to the surface of the board is shown in the accompanying drawing. It consists of two clamps attached to the underside of the board. The clamps are two strips, A, of 1 by 1½-in. material, cut to follow the outer edge of the board. Six 4-in. strips of 3/16-in. strap iron are slightly bent, as shown in the detail, and are drilled for two screws, one near the center and the other near the unbent end. The clips are attached to the clamping strips and to the board, as indicated, and wooden blocks, B, are attached to the board with screws so that they can be swung directly under the strap-iron clips. With the blocks in this position, the clamping strips hold the cloth securely.—W. Mitchell, Rogers, Neb.



Easily Loosened Clamping Strips on Underside of Ironing Board Hold Cloth Securely

Ship-Model Kinks

Sandpaper, in addition to smoothing surfaces, is a splendid medium for reducing and shaping small objects that cannot be satisfactorily handled with ordinary tools. For instance, spars and masts, after being roughly formed with a block plane, may be quickly brought to size and shape by drawing them back and forth through a fold of sandpaper held in one hand, or they may be laid on an even surface and rubbed with a sandpaper block. I have found small ½ and ¼-in. pins excellent for fastening parts that are too small for the use of ordinary brads. They do not split the wood and have good holding power for their size. In driving larger pins, they are much less likely to bend if the shank of the pin is grasped firmly with the thumb and forefinger while they are being driven in. I tried to get round wooden toothpicks for belaying pins, but could find only the flat variety; I therefore used insulated copper wire of suitable size, removing the insulation. In making deadeyes from black-celluloid knitting needles, I used a small miter box and a small backsaw. I first cut the groove for the end of the shroud, the thumb and finger forming a shoulder to keep the needle in the proper position. The needle is revolved

while the groove is being cut, and is then cut off to the desired size. The deadeyes are placed in a small vise while the holes for the lanyards are made with a fine hand drill. By this method I made all the deadeyes for the "Halve Maen" in two hours.—F. G. Semple, Ottawa, Can.

Cleaning Gasoline Lamp

I am living in a rural district and use a gasoline lamp with which I have always had more or less trouble, due to the generators clogging with carbon or dirt. I tried various methods of cleaning them but with no avail, until I thought of putting them into a fire and raising them to a blue heat, which burnt the dirt out of the generator, thus making it serviceable again.—M. S. Holmes, Hamden, Conn.

Chicken Shelters Made from Auto Hoods

An ideal chicken shelter can be made from an old auto hood. A farmer near Geneva, Nebr., utilized this idea and has a large number of coops of this kind on his place. Any garage or dump heap usually yields several hoods. The ends are fitted with boards which are cleated together on the inside. The exact size and shape of the ends vary, depending on the make of the car from which the hoods are taken. Nails driven through the edges of the sheet metal into the wooden ends will hold them tightly in place. The coops are always set to face the southeast so that rain and wind will not come in through the ventilator slits. If desired, these may be closed entirely by bolting or wiring a piece of heavy cardboard on the inside.

Raft Made from Inner Tubes and Saplings Has Considerable Buoyancy

Raft Made from Inner Tubes

Often it is desired to use a raft for fishing when a boat is not available or cannot be used owing to weeds. In such cases a raft of the kind shown herewith will be found handy. It consists of three or more inner tubes which are inflated and lashed to a framework made from saplings. Three 5-in. inner tubes, overinflated about 50 per cent, will afford a buoyancy of approximately 250 lb. A pole or paddle is used to propel the raft. While such a water craft is not very speedy, it will at least carry the fisherman about.

Another Use of the Vacuum Cleaner

Combination stoves are used in many homes today and their upkeep may be either a pleasure or a hard job. Cleaning out the stove can be done without a particle of dust in the kitchen if the vacuum cleaner is used. It takes less time by this method than brushing, is also more pleasant, as the job of cleaning a combination stove usually is quite dirty.

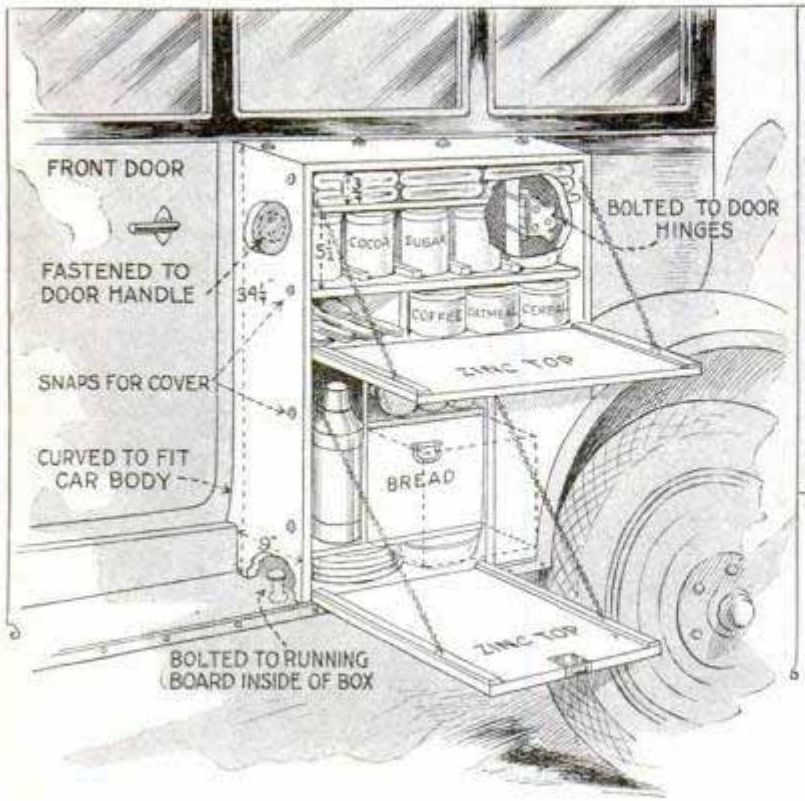
Auto "Kitchen" for the Tourist

By M. GOODFRIEND

AS a watchmaker, my occupation forces me to seek frequent outdoor recreation, such as camping and fishing. Having a great deal of camping equipment to haul along each time, and finding it more or less difficult and inconvenient to pack foodstuffs properly, I devised the running-board "kitchen" shown in the accompanying illustration and photos. It is arranged to accommodate various containers of coffee, oatmeal, sugar, bread, butter, etc., each of these being held in place securely.

The kitchen is merely a large wooden box or cabinet, which is bolted to the running board, extends to the lower edge of the rear-door window, and is exactly as wide as the running board. In my case, the dimensions were 34¼ in. in height and 9 in. in width, ¾-in. lumber being used for the sides and ½-in. stock for the shelves and partitions. The front side is made in two sections, both of which are hinged at their bottom edge so that they can be let down to form a table top, lengths of ordinary furnace chain being provided to hold them horizontally for this use. It is a good idea to tack thin sheet zinc on the inside of these sections, so that spilled liquids can be wiped off more easily, enabling one to keep the kitchen sanitary without much trouble.

As can be readily seen from one of the



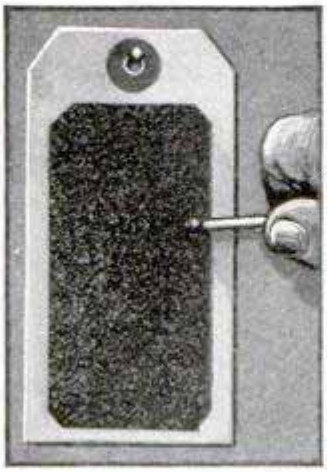
Tourist's Auto "Kitchen," Attached to Running Board, Carries All Foodstuffs, Pans and Cooking Utensils, as Well as Table Ware and Necessary Linen, and Is Provided with a Dust and Rain-Proof Cover; Top Photo at the Left Shows How the Hinged Sides Provide Ample Table Space

photos and the drawing, the top shelf is used for napkins and towels, the second for cans of staple provisions and the third shelf for more cans and for spoons, knives and forks. A bread box and a vacuum bottle are kept in the lower compartment, and below these is a place for frying pans. Besides bolting the box to the running board, as indicated, an additional support is provided by fastening the top part of the box to the handle and the hinge of the rear door. The door handle should extend inside of the box. In order to exclude rain and dust, I made a cover from auto-top material, using snaps and eyelets to hold the cover in place. The cost of the whole arrangement did not exceed $5, and I have found it to be a great convenience on camping trips, as there is a place for every item and no foodstuffs have to be carried inside of the car, which is somewhat objectionable.

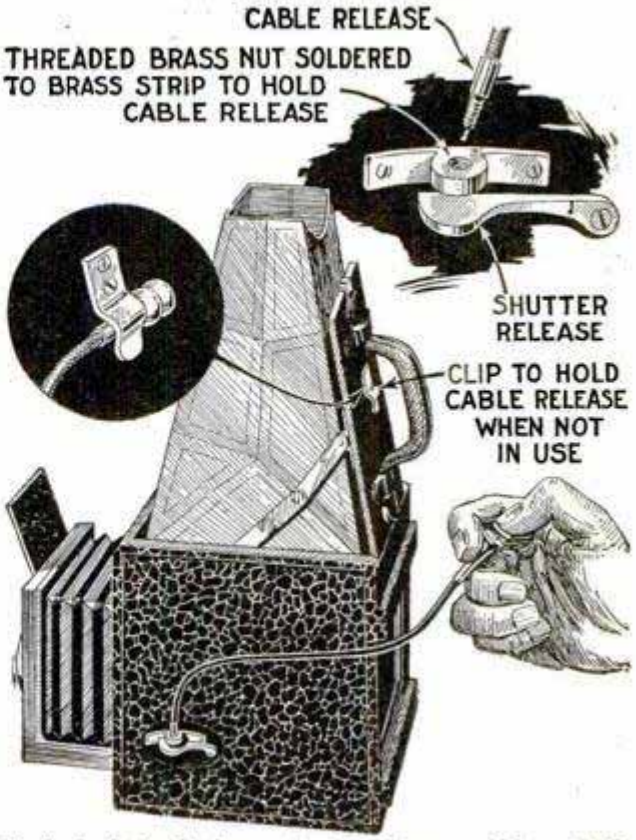
Electric Iron Thaws Frozen Pipe

Last winter my electric iron and an extension cord proved more efficient than a plumber's candle in thawing out a frozen water pipe, the heat from the iron being steady, moderate and yet sufficient to do the trick. The iron was located far enough away from the frozen place to work gradually without bursting the pipe. The water trickled in fifteen minutes and ran freely in thirty minutes.—Hilda Ellyson Allen, Onawa, Iowa.

Match Striker from Shipping Tag



Nimble fingers and decorative talent can produce artistic match strikers, but one which is just as serviceable and durable can be made by gluing a piece of emery cloth or sandpaper to a heavy shipping tag, as shown. The metal eyelet of the tag makes it last much longer than an ordinary unreinforced piece of cardboard tacked on the wall.



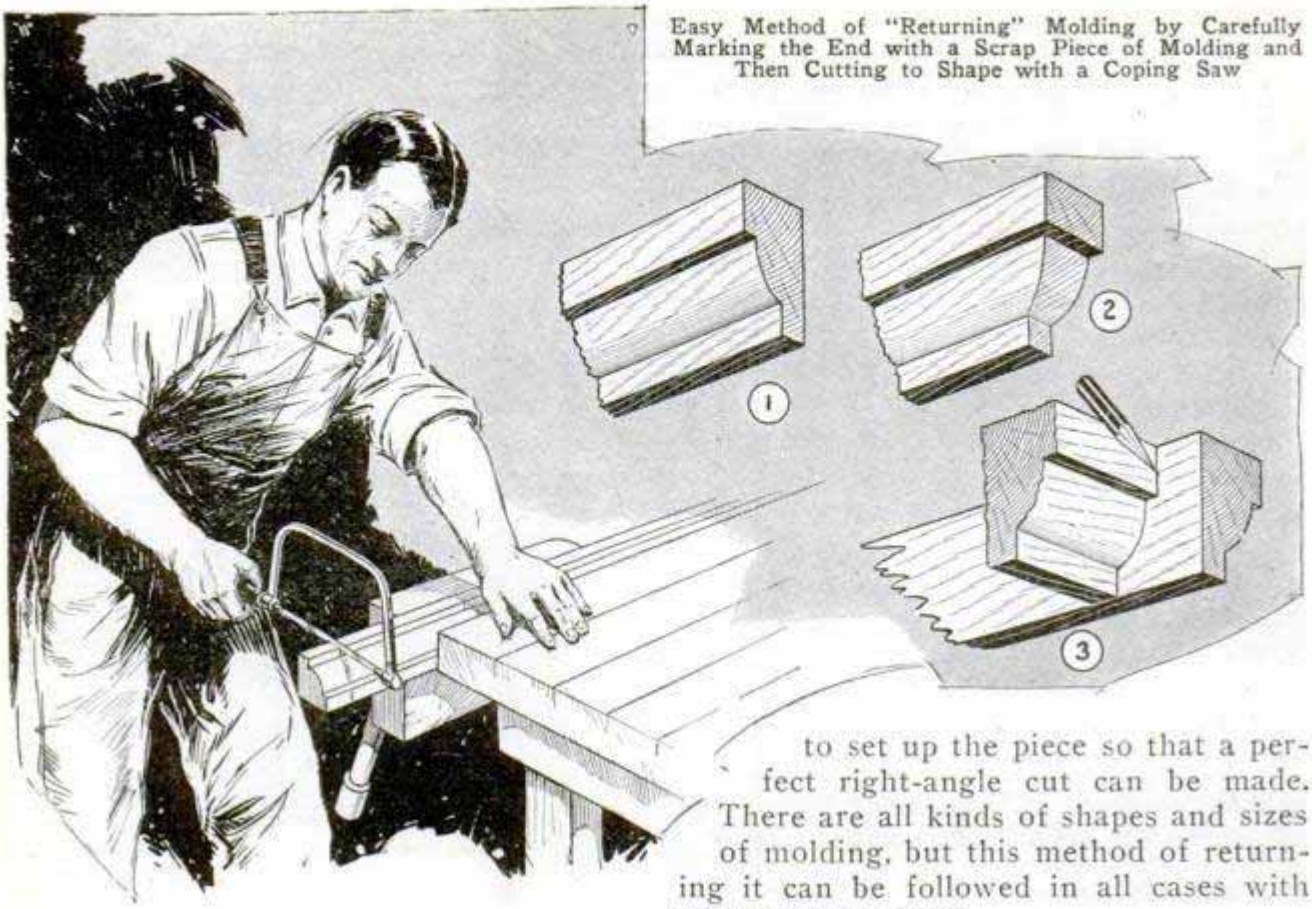
Method of Equipping a Graflex Camera with a Cable Shutter Release

Cable Shutter Release Fitted to Camera

Photographers, both amateur and professional, who use Graflex or reflecting-view types of cameras, frequently have need for a cable shutter release, as, for instance, when overexposures are made from a tripod; when operating the camera in positions where the use of the trigger release is inconvenient or awkward, and especially in making photographs with the aid of an automatic timer so that the photographer might also be in the picture. To meet the trouble without discarding the regular trigger release, apply the cable shutter release as indicated in the accompanying drawing. This does the job perfectly and does not interfere with the use of the trigger shutter when the employment of the latter is preferable.

Transferring Colored Prints from Comics

Rub the print you wish to transfer with common household paraffin, then place a white sheet over the colored comic and rub the paper with a spoon or any smooth object. The result will be an exact reproduction. With a little practice good results will be obtained.—H. V. Smith, Wauseon, Ohio.



Easy Method of "Returning" Molding by Carefully Marking the End with a Scrap Piece of Molding and Then Cutting to Shape with a Coping Saw

How to "Return" Molding

It is often necessary on small pieces of furniture that are decorated with moldings, to saw the ends of the latter to correspond to the contour of the face. This is known as "returning" the molding, and although most professional woodworkers know how to do this, it is sometimes a puzzling task for the amateur. A simple method is shown in the accompanying drawing. Fig. 1 shows the end of a piece of molding which is to be returned, and Fig. 2 the same end after this has been accomplished by means of a small coping saw.

The end to be returned is first carefully marked with a pencil, tracing along the edge of a short scrap piece of the same kind of molding, which is cut off exactly square so that it can be set at right angles against the back side of the first piece, as shown in Fig. 3. After the pencil mark has been made plainly, the piece to be cut is placed in a vise, and a coping saw is used to make the cut. When doing this, care is necessary to get the cut at right angles, or the contour of the end will be different from that of the face of the molding. If a jigsaw is available, it is often possible to set up the piece so that a perfect right-angle cut can be made. There are all kinds of shapes and sizes of molding, but this method of returning it can be followed in all cases with satisfactory results.

Preventing Small Boats from Drying Out When Laid Up on Land

The usual manner of hauling out a small boat for storage on land when not in constant use has some objections in that the planks dry out too thoroughly, allowing the seams to open up, which makes it necessary to use some seam filler or putty before the boat is put in use again. The trouble can be easily overcome by covering the boat with a layer of hay or seaweed after it is turned bottom up, and stretching some chicken wire or an old fishing net over it to hold the weeds in place. This should be thoroughly fastened along the gunwale on each side so that the wind cannot get under the weed. Rain will soak into the hay or weed, and the sun and wind will not dry it out sufficiently to rob the planking of its moisture. The boat can be put in the water whenever it is convenient. Of course, the bottom should be given a coating of copper paint before the boat is put up for the winter. You will find that a boat given such care will not leak when it is put in use, and its life is also prolonged, as the swelling and contraction of the wood in

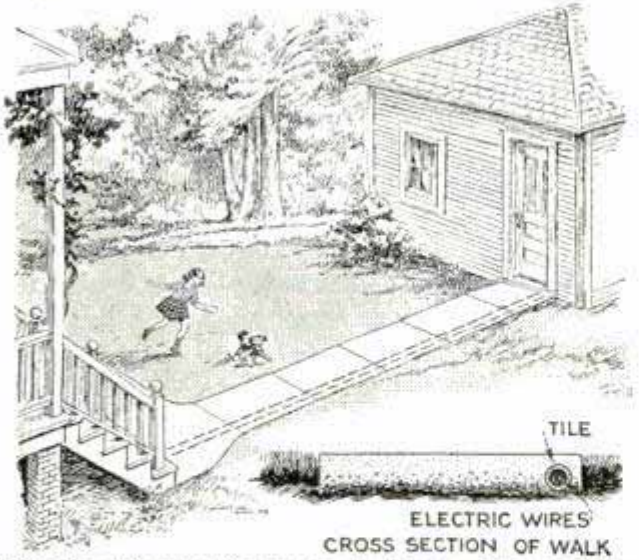
small boat hulls is very hard on the fastenings when stored in the ordinary careless manner.—Newcomb Leonarde, Mystic, Conn.

How to Remove Broken Bottle Stopper of Glass

If the glass stopper in a bottle is broken off, it may be removed without difficulty in the following manner: Obtain a piece of shellac or pitch, about ½ in. in diameter and 6 in. long, soften the end and let it set firmly on the broken end of the stopper. Then heat the bottle carefully, applying the heat around the neck where the stopper is stuck. While doing this, gently pull the pitch. I have removed hundreds of broken stoppers in this manner without a single failure.—Wm. Hurley, San Francisco, Calif.

Electric Conduit Imbedded in Concrete Walk to Garage

Electric wiring from the house to the garage can be run through conduit imbedded in the concrete walk when the latter is laid. This method eliminates overhead wires, which are more or less objectionable and may cause trouble. If no conduit is available, ordinary tile can be used, but in that case, flexible metal-covered conduit should be used instead of separate rubber-covered or weatherproof



Running Electric Conductors to Garage through Conduit Imbedded in the Sidewalk

conductors. If desired, bell wires can also be installed in the conduit.—L. H. Georger, Buffalo, N. Y.

Casters for Heavy Suitcases

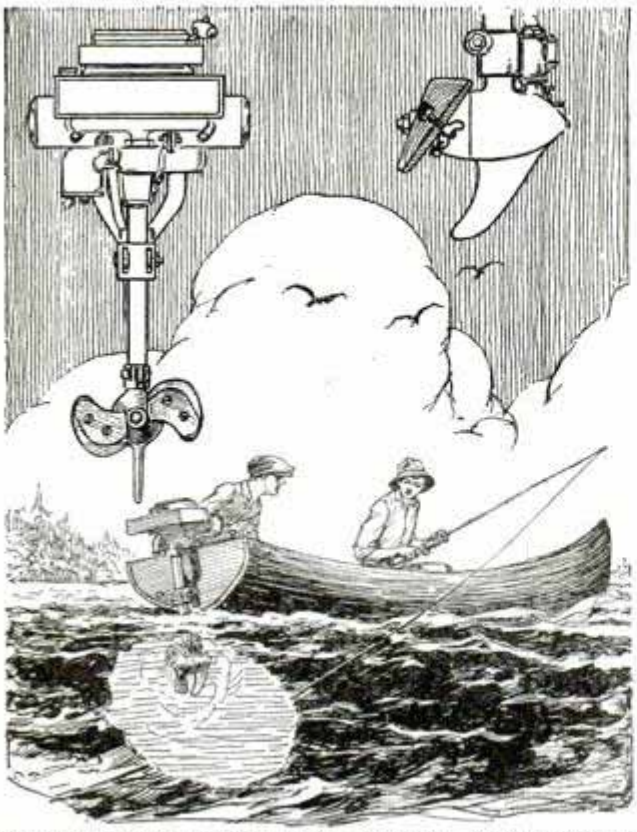
Rather than carry an exceedingly heavy suitcase, one salesman fitted it with casters, which enabled him to roll or push the

Lightening the Salesman's Burden by Equipping Heavy Suitcases with Casters on One Side

suitcase along whenever he walked over a strip of floor or sidewalk. The drawing shows two methods of attaching the casters. Either method can be used, whichever is the most convenient. Rubber or fiber casters are best for this purpose.—Ben Rocklin, Chicago, Ill.

How to Remove Bruises in Woodwork

A bruise or hammer mark in fine finished woodwork detracts greatly from its appearance, but by careful treatment such dents can be removed. One way is to wet the part with warm water. Fold a piece of brown paper several times, soak it in water and lay it over the bruise. Then apply a hot flatiron until the moisture is completely removed. If one such treatment does not suffice, repeat until the bruise disappears. The indented surface of the wood will swell and rise level with the rest. A slight rubbing will smooth down any raised grain. Small bruises can be obliterated by filling them with boiling water and then holding the end of a red-hot poker near the surface.



Wooden Blocks Attached to Propeller Blades Retard Speed of Outboard Motor

Retarding Outboard-Motor Speed

Unless an outboard motor is equipped with variable gears, its speed cannot be reduced sufficiently to permit slow trolling, which is necessary for lake trout, pike and salmon fishing. The only speed control on a two-cycle motor is the spark. But to run continuously on a late spark causes undue heating, which may burn away the oil supply and score the cylinders. A simple method of checking a boat's speed and, at the same time, permit a more advanced spark, is shown in the drawing. Beveled oak blocks are bolted to the propeller blades as indicated. The blocks can be shaped to alter the pitch of the propeller to any desired degree, the exact angle, or pitch, being best determined by experiment. The blocks are bolted to the blades with ¼-in. bolts and wingnuts. It is well to drill small holes through the wings of the nuts and wire each pair together, to prevent loss.

Renovating Floor Mops

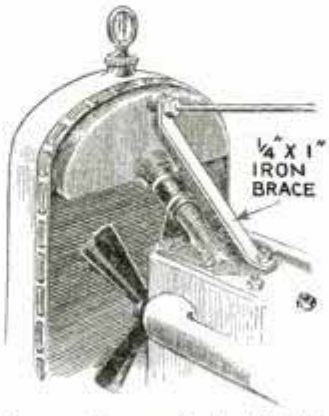
Many floor mops are thrown away after a few months of use without any effort being made to reclaim them. It is an easy matter to renovate them, however. Add a tablespoonful of concentrated lye to a pail of boiling water, and boil the mop in this solution for about 10 minutes. Rinse in clear, hot water and allow the mop to dry thoroughly. It can then again be saturated with clean floor oil and will be serviceable for another six months.—L. H. Georger, Buffalo, N. Y.

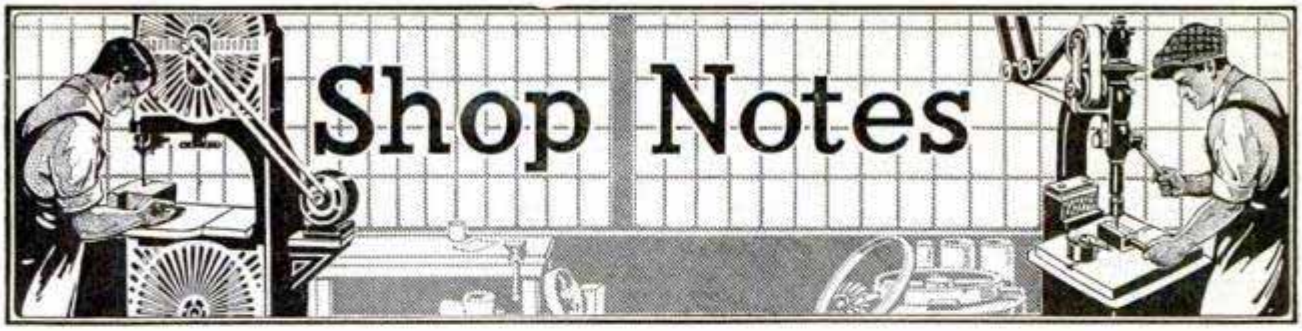
Avoiding Light Streaks on Film Packs

Every photographer who has used film packs has probably found one or more of his best negatives fogged, which was caused by leakage of light into the film pack. A pack has not yet been made that can be relied upon to be absolutely light-tight under all circumstances of use. After attempts to use film packs involving experiments to exclude the light, one photographer found an effective method. Set up the camera and insert the film pack. Place the focusing cloth over the back of the instrument and remove the dark slide. Make the exposure. Replace the dark slide, and withdraw and tear off the tab of the exposed film, working all the time with the hands under the focusing cloth. The film-pack adapter can then be removed from the camera with practically no possibility of fogged negatives. Any other method, except taking the camera into a dark room before and after each exposure, is at the risk of losing a negative every time from light leakage.

Radiator Brace for Autos

On many types of cars the long stay rod attached to the top of the radiator and the dash transmits body movement to the radiator, which consequently loosens the hose. This trouble can be readily overcome by attaching a flat iron brace of ¼ by 1-in. stock, as shown, and bent to the shape indicated. It can be fastened without drilling or tapping the block, if the brace is made to fit the studs already there. —G. A. Luers, Washington, D. C.

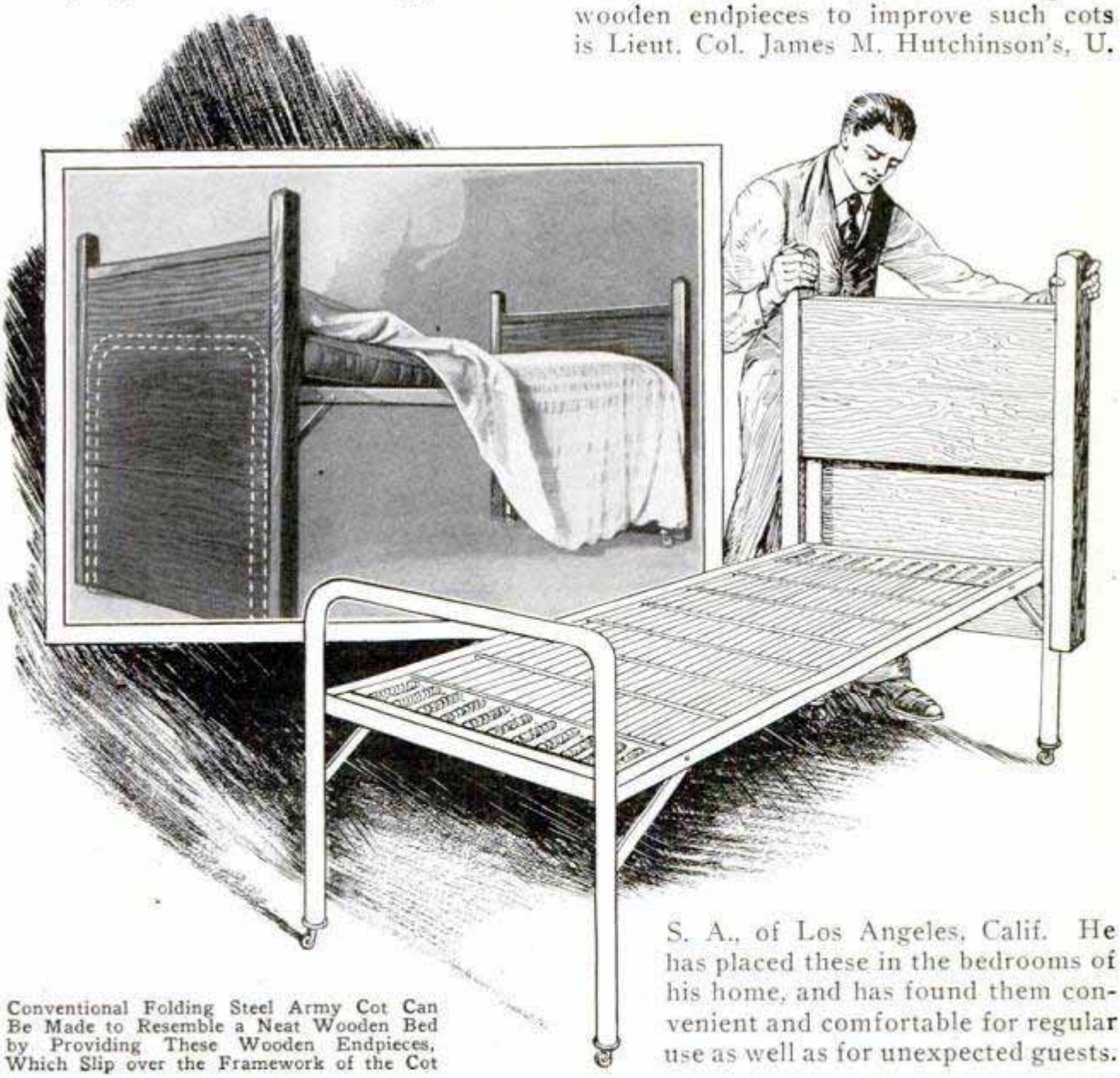




Army Cots Become Attractive Twin Beds

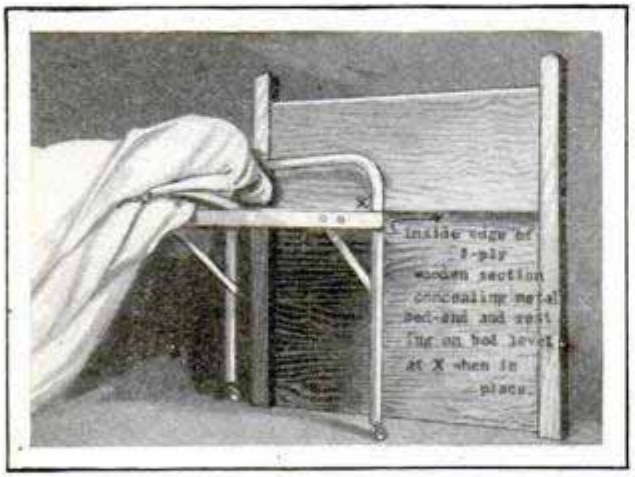
By ALPHEUS LINCOLN

COMFORTABLE and good-looking twin or single beds, as shown in the photo, can easily be made from ordinary metal army cots, which, in themselves, are not by any means attractive in appearance. The cost of these cots is slight in comparison with that of regular beds, as a spring and mattress have to be purchased separately for the latter in addition to the frame itself. The credit for devising the wooden endpieces to improve such cots is Lieut. Col. James M. Hutchinson's, U. S. A., of Los Angeles, Calif. He has placed these in the bedrooms of his home, and has found them convenient and comfortable for regular use as well as for unexpected guests.



Conventional Folding Steel Army Cot Can Be Made to Resemble a Neat Wooden Bed by Providing These Wooden Endpieces, Which Slip over the Framework of the Cot

First, the bed is lowered by cutting a piece, 5½ in. in length, off each leg, the casters being replaced on the legs after the pieces have been removed. This procedure is not really necessary, but was desired in this case, the bed being lowered from 21 in. in height to 15½ in. The wooden endpieces are then made. Lengths of 2 by 2-in. white pine are used for the posts, which do not bear the weight of the bed but are merely ornamental. Pieces of three-ply veneer are fitted and glued in grooves cut in the posts, as indicated, and a 1 by 2-in. rail of white pine is fitted on top of the veneer to give a more finished appearance. The rail is held in place between the posts by finishing nails, and, if desired, may also be grooved to fit on the veneer. The pieces of veneer are spaced far enough apart to permit them to be slipped over the framework of the bed as shown. On one side the veneer reaches down to the floor but on the other side it extends only to the spring. The side rails of the bed itself, which are level with the spring, bear the weight of the endpieces, as shown in the small photo, the lower end of the latter being raised about 1 in. above the floor. This arrangement allows the bed to be moved about without any trouble. The wooden endpieces are carefully stained some suitable color and varnished when completed.



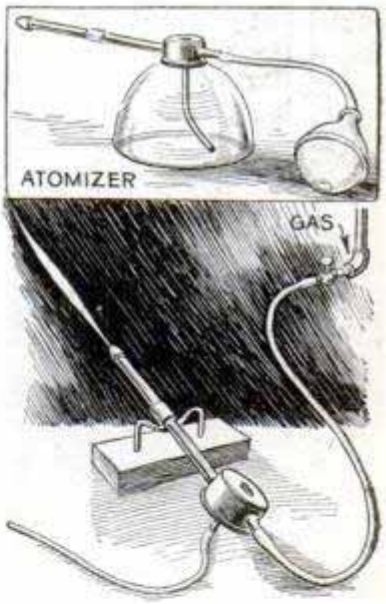
Inside View of Endpieces, Showing How They Rest on the Bed Frame

Cutting and Drilling Corks

There are many occasions when a stopper or other piece of cork has to be cut or drilled, and, unless one knows the method of doing the work correctly, the job is apt to be a ragged one. The best methods of handling cork are as follows: To cut it, provide a dish of water and a sharp knife. Then, dipping the knife almost continually in the water, rough-shape the cork. Then finish the job with a fairly coarse emery wheel, if available, or use a hand-sharpening stone and water, rotating the cork in the fingers while drawing it over the stone. For drilling cork, obtain a piece of thin-walled steel tubing the diameter of the hole desired and sharpen one end on a whetstone. Bevel the edge like a chisel. Drill a hole through the other end and drive a wire nail through for a handle. Hold the cork in the left hand and rotate the sharpened tube with the right, pressing it through the cork. Such a drill will cut a clean hole.

Useful Homemade Blowtorch

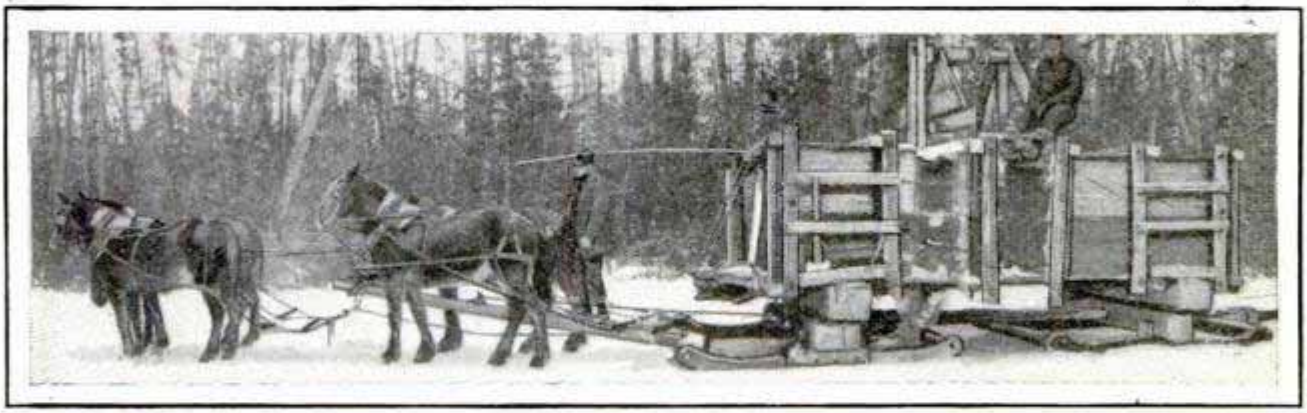
A simple, cheap and extremely useful blowtorch can be made from an ordinary atomizer, a piece of gas pipe or other gas-tight tubing, about 3 or 4 ft. long, and a piece of smaller tubing about 2 ft. in length. The latter is used to produce an especially hot flame, and is not necessary for general use. The nose piece or cap is removed from the atomizer, the glass unscrewed and the large tubing is placed where the short tube to the bulb commonly is connected. This torch will serve well for general experimenting, as the tip is adjustable to various angles. If desired, the small tube may be slipped over the lower, bent tube, and blown through. Care should be taken to blow steadily in order to prevent extinguishing of the flame by a sudden blast.



¶A good rolling pin can easily be made from a 12-in. length of aluminum tubing.

Taking Long, Narrow Photos

When it is necessary to take a long, narrow photo like the one shown here, I set up my camera and take parts of the scene separately, joining them together. This can readily be done and the separate photos will fit together nicely, provided the camera is kept in the same position while being rotated on the tripod.—J. J. Brindos, International Falls, Minn.



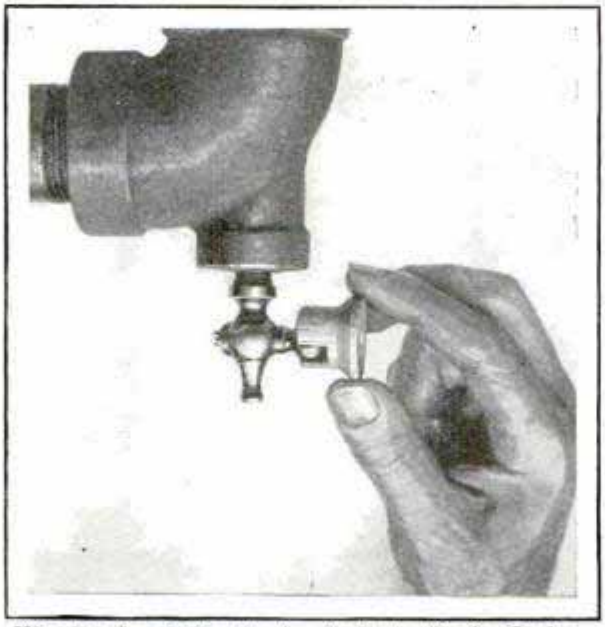
Large, Narrow Photos like This Can Be Taken with Any Ordinary Camera, Two Halves Being Taken Separately and Joined Later

Locating Air Leak in Condensing Turbine

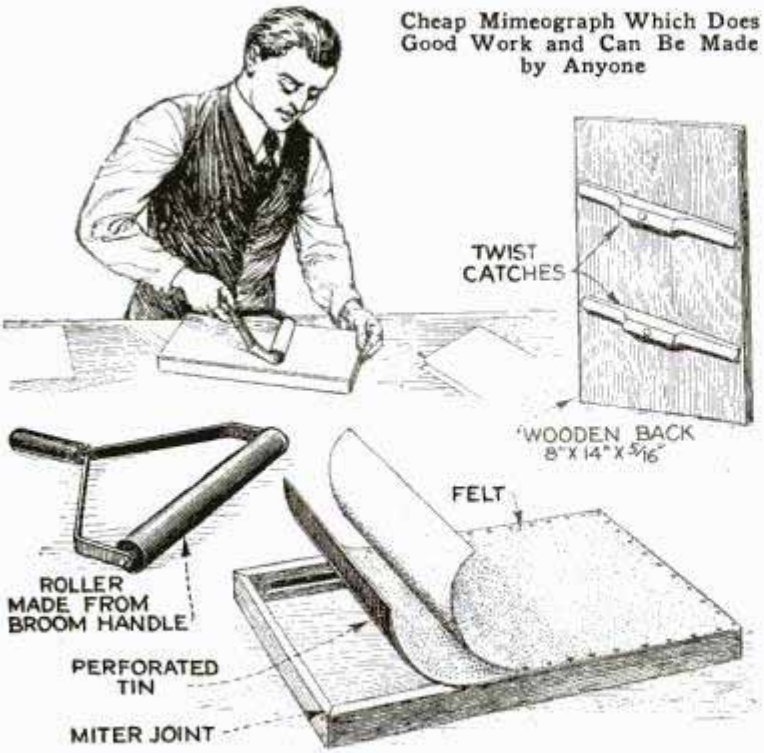
Someone has said that a little leak will sink a big ship, and the same statement might easily apply to a condensing turbine, for if a turbine of about 500-kw. capacity were fully loaded and a hole, ¼ in. in diameter, should be drilled in the condenser above the water line, it is highly probable that, unless the load were reduced or the initial steam pressure increased immediately, the turbine would slow down until it stopped or until the load was light enough for it to pull it noncondensing. A leak of this size would no doubt be discovered, but small leaks that let in a small amount of air constantly cause a loss of efficiency. Trouble of this kind was experienced by the writer some time ago. All the joints in the machine and condenser had been gone over and painted with shellac, and every means tried to find this small leak but to no avail. Finally, someone suggested that the machine be shut down and the turbine casing and the condenser filled with water, for it was reasoned that if air could get in water would come out. The plan was given a trial and a tiny trickle of water flowed out over one of the clamping rings on the corrugated-copper expansion joint between the turbine and the condenser. The continued "breathing" action at this point, due to expansion and contraction, had finally opened a small crack, which, being behind the clamping ring, could not be seen. A new expansion joint corrected the trouble. —Earl Pagett, Coffeyville, Kans.

Cool Grip for Small Drain Cocks

When hot, the drain cocks on radiators or heating coils cannot be handled comfortably with the bare fingers or even light gloves. To remedy this, saw a wooden spool in two and cut a slot in it as shown in the photo. The slot should be formed so that the spool will grip the cock handle securely. The spool will always afford a cool grip, and a better one for turning the stem if the latter is a little tight.—Frank W. Bentley, Jr., Missouri Valley Iowa.



Wooden-Spool Handle for Radiator Drain Cocks



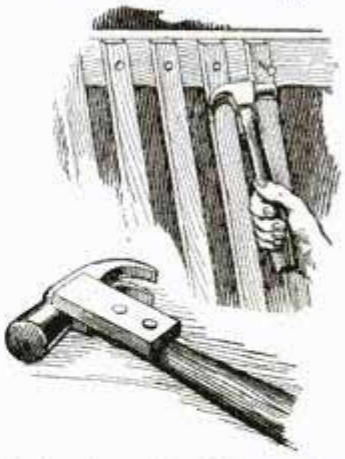
Cheap Mimeograph Which Does Good Work and Can Be Made by Anyone

How to Make a Practical Mimeograph

A commercial mimeograph is usually rather costly, but one that will turn out good copies in any number can be made for almost nothing. Four lengths of ¾ by 1-in. wood are cut to form the frame, which measures 8 by 14 in., inside dimensions. The joints are mitered and nailed to make it rigid. A piece of wood, 5/16 in. thick, 8 in. wide and 14 in. long, is fitted loosely in the frame to form a removable back. The frame is laid on a level surface, the back is pushed down into it against the surface, then two pieces of ½ by ¾ by 8½-in. wood are made into twist catches and attached to the back with one screw in each, as shown, a groove being cut in each side of the frame to receive the catches. Turn the frame over and tack a piece of perforated tin over the entire top, nailing it to the frame only, so that the back can be removed by loosening the catches. Next tack a light piece of felt over the perforated tin surface; this is the ink pad. A light piece of bright tin is cut the same size as the back and put into the frame between the perforated tin and the wooden back in order to prevent the wood from soaking up the ink. This completes the mimeograph. A stencil sheet of the type used in mimeographs is obtained, and a negative stencil is made in a typewriter according to instructions on the stencil sheet. The back of the mimeograph is removed and mimeograph ink is applied to the perforated tin with a small paintbrush, until the felt pad is evenly soaked but not saturated. The tin plate and wood back are then replaced and the stencil sheet is spread out evenly on the ink surface and pressed lightly with the roller until it adheres to the inky surface. The mimeograph is now ready to print, and a sheet of paper to receive the copy is spread over the stencil sheet and rolled firmly but lightly with the roller. The copy is removed from the stencil sheet and the process repeated any number of times. If the copies become indistinct, remove the backing and apply a little more ink to the perforated tin surface; this is not necessary for less than 125 copies.—Steward A. Marshall, Jr., Rome, Ga.

Gauge for Measuring Latticework

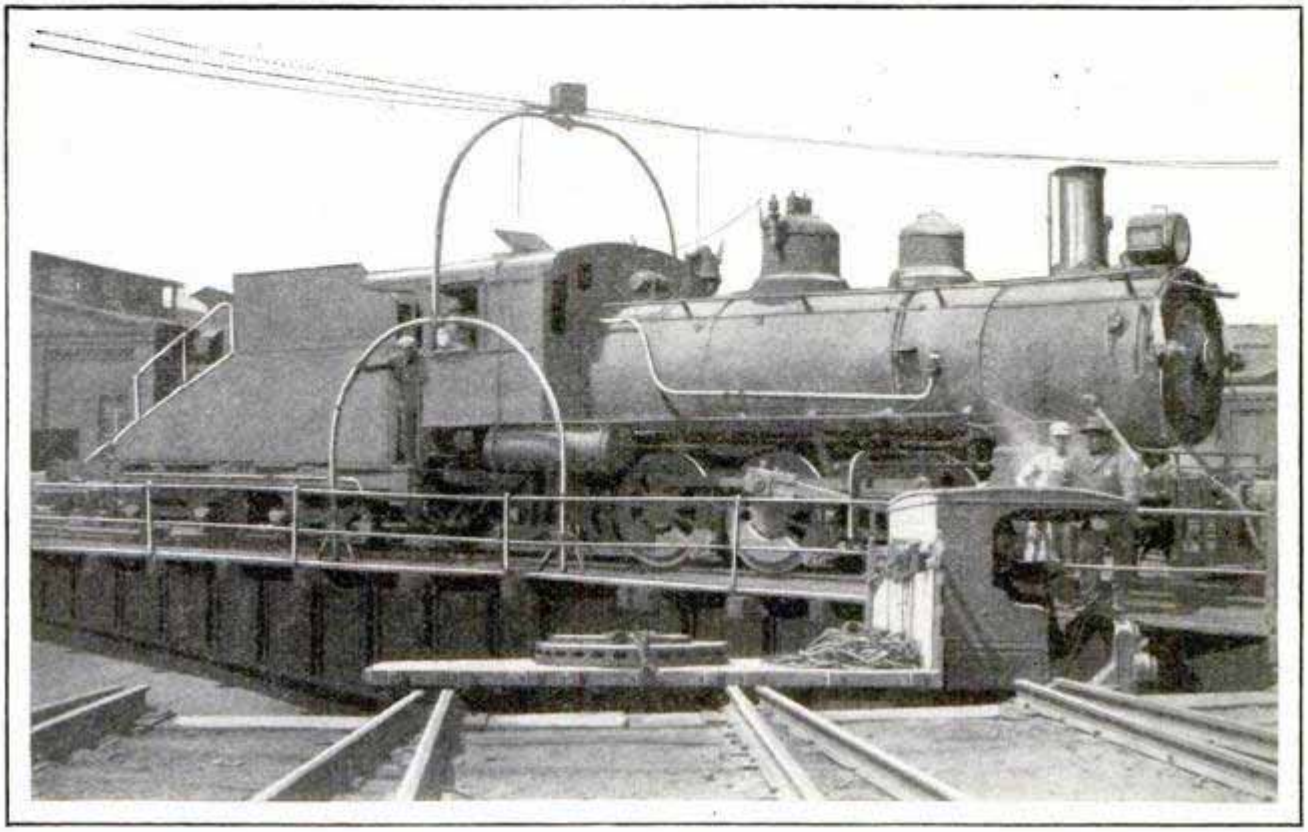
In the construction of latticework, it is common practice to space the battens by their own width, and this distance is usually measured by means of a piece of batten. When doing some of this work, recently, I found that the method of spacing was greatly facilitated by tacking a short section of batten on the hammer handle, with its end slightly below the top of the hammer head, as shown in the illustration, so as not to interfere with nail pulling. The spacing block was thus under the control of the hand holding the hammer handle, and this made the work easier.—Royle Snow, Westmount, Can.



¶A casting should be well pickled and free from sand before it is placed on a milling machine.

Truck Replaces Turntable Motor

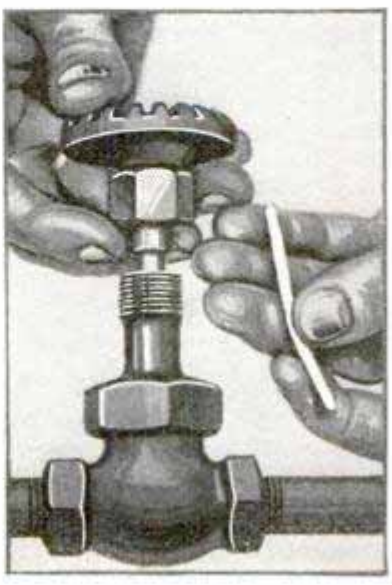
The 25-cycle electric motor which operated the turntable in the motive-power yard of an eastern railroad failed. As the turntable led to forty-six tracks, and it was necessary for the engines to utilize it in making return trips, all traffic would have been tied up had the table ceased functioning. This could not be permitted at any cost. At first, there seemed to be but two possibilities. A new motor might be purchased at a cost of from $1,500 to $1,800, but this plan was not feasible because 25-cycle motors of this type were not carried in stock, and it would have taken several weeks to manufacture one to order. The second possibility was the use of approximately eighteen men to keep the table in motion. But the trouble with this plan was that it would cripple operations in other quarters. The foreman of the auto-trucking department came to the rescue. He argued that a truck could be lowered into the turntable pit with a crane and that the truck could push the table around with the loss of but one man's time and one truck. A 2½-ton truck was first lowered into the pit, but it was soon seen that it was too light for the work. A 5-ton truck was accordingly substituted and for two and a half weeks it pushed the turntable around until the motor had been repaired. To connect the truck to the table, a special bar was made and clamped to the heavy front bumper of the truck and the lower portion of the turntable.

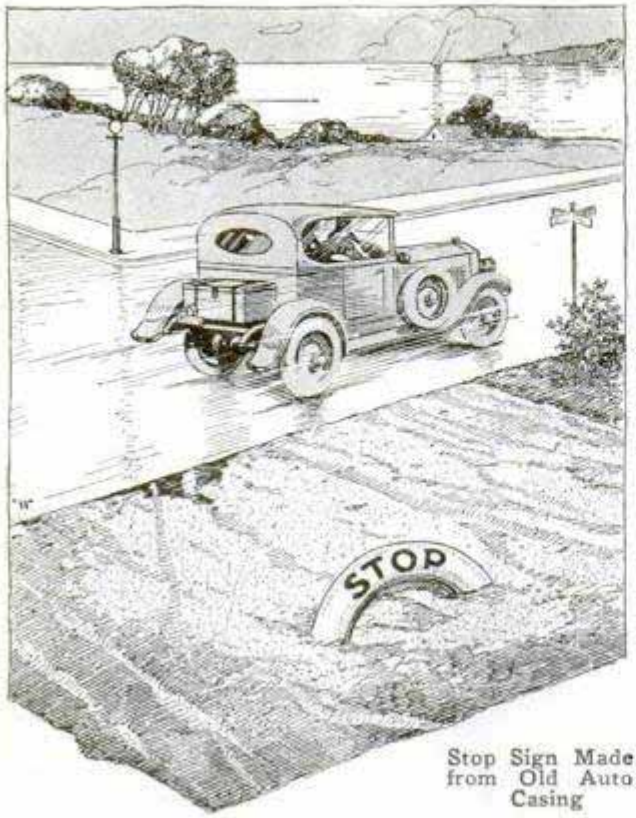


Five-Ton Truck Moved Heavy Locomotive Turntable While Electric Motor Was Out of Service, Doing the Work of Eighteen Men, Which Would Otherwise Have Been Required

Good Packing for Small Valve Stems

Packing of small valve stems frequently gives out and this often occurs at a time when there is nothing handy with which to repack them. The following emergency method will then be found helpful: Take the tinfoil from a cigaret package, roll it tightly to form a string, as shown, and slip it under the gland.





Stop Sign Made from Old Auto Casing

Stop Signs for Motorists

A number of unpaved side roads in a western town terminated in a busy boulevard and no regular electric stop signs were provided. To give proper warning, to the motorist coming onto the boulevard over these side streets, cheap and effective signs were arranged as shown in the illustration. They consist of old auto tires imbedded in the dirt so that only a section projects above the surface. The word "stop" is painted on the visible portion of the tire. Nearly every motorist is looking at the road while driving, and his attention is arrested by the sign, both during the daytime and at night. Such stop signs will not damage a car even if they are driven over accidentally.—A. Oscar Wiggenjost, Lincoln, Nebr.

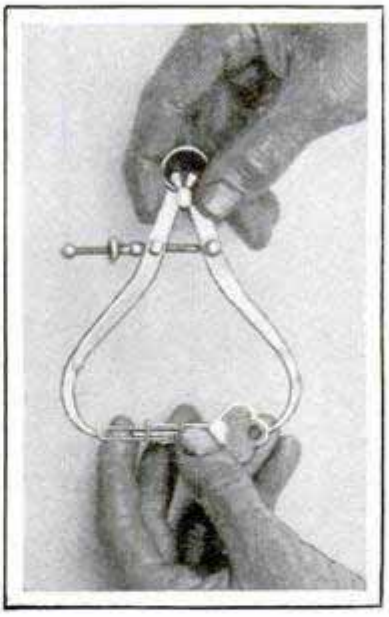
How to Prevent Corrosion in Air Pipes

Corrosion in air pipes can readily be prevented by mixing about 2 gal. of water glass with 1 gal. of water. Open the air valve, allow all the air to escape from the tank and then pour in the mixture. Start the compressor and, when the tank gauge registers about 20 lb. pressure, the mixture can be blown through the pipes and out of the hose. All tools should, of course, be disconnected from the air line before this is done. Open the valve only about one-fourth. The water glass will be deposited on the walls of the tank and pipes, preventing the formation of rust. Water glass should never be used without water.—August Jeffers, Philadelphia, Pennsylvania.

Gauge for Testing Try-Squares

The invariable dispute regarding the trueness of a try-square is not proved by reference to another square. Both may be out of true and consequently a check by this method is valueless. A cold-rolled steel gauge is used in the tool room of one shop for testing try-squares. It is about 5 in. long and 3 in. in diameter. The outside diameter is ground to a true cylinder and one end is ground at the same time or at the same set up, to provide an edge, circular in shape, on the test end of the gauge. The inner surface of the end is cupped or relieved. In use, the stock of the square is set against the end of the bar and the blade against the side. If the grinding machine is capable of grinding a true cylinder, this is one of the most accurate methods of forming a 90° angle.

Inside Calipers for Close Quarters



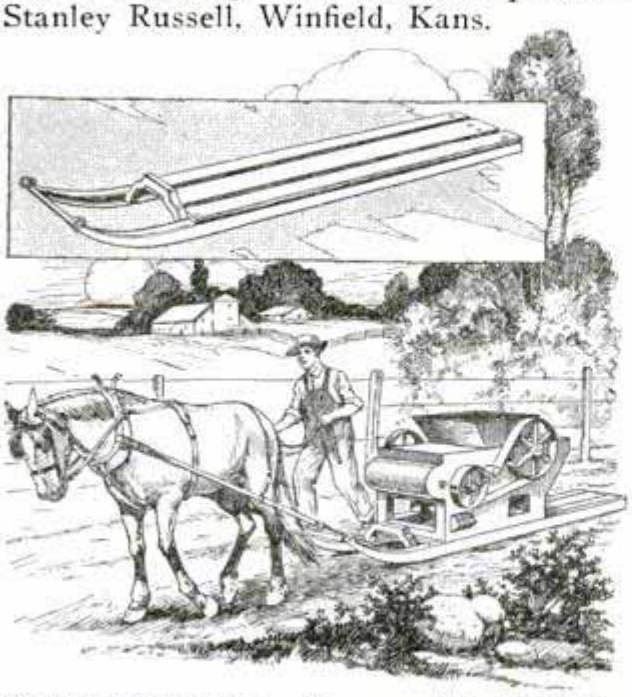
The writer had some small followers to turn for several cylinders, which, because of their location, could not be calipered with the usual small tool. A key and a short loop of wire were assembled as shown, the wire being held firmly in the grooves by twisting two shorter bits of wire around the key and the wire loop. It was easy to handle and adjust, the holes being satisfactorily calipered.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Making Chain Block Work Both Ways

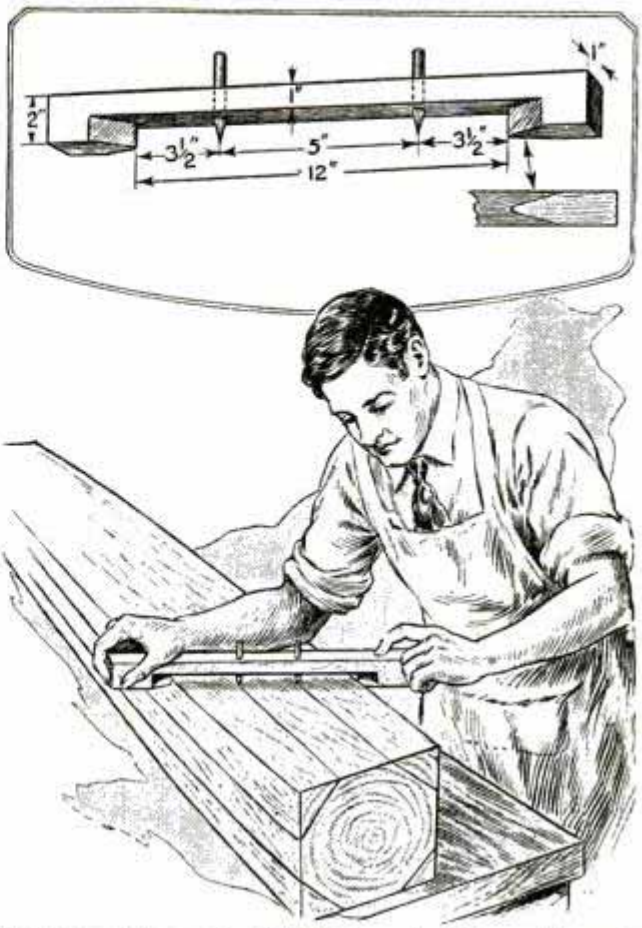
On many jobs where hand lifting is necessary with a worm hoist, more commonly known as a screw or chain block, there is a time loss of 5 to 10 minutes on each hoist, depending upon the number of stories that the loads are being raised. In addition there is the extra labor of working the chain until the hook returns for its next lift. The loss and unnecessary work can be eliminated by making the chain block work both ways. Cut a link in the slack of the lifting chain and attach a hook as on the opposite chain.

Farm Sled from Old Auto Frame

The farm sled shown herewith was made from a discarded auto frame turned upside down. The engine hanger was left on the frame, but the cross members were removed, to allow sufficient clearance. The rod across the front of the sled was placed through the holes formerly occupied by the spring bolts. The rod forms the hitch and strengthens the sled at this point. Lengths of 2 by 6-in. wood were attached across the top of the runners and covered with 1-in. lumber, to form the top of the sled. The sled may be used both during summer and winter, being especially handy for hauling water, fodder, posts and for doing many odd jobs about the farm where a strong, low sled is required.—Stanley Russell, Winfield, Kans.



Old Auto Frame Makes a Strong and Useful Sled for Hauling about the Farm



Improvised Gauge for "Eight-Squaring" Large Tapered Pieces of Timber

Gauge Aids in "Eight-Squaring" Timbers for Spars

After squaring a timber and shaping it to the proper taper for making a spar, such as a mast, boom or flagstaff, the first move is to "eight-square" it. The accompanying drawing shows a simple and handy gauge for doing this. It consists of a length of 1-in. wood, cut as indicated in the detail and drilled at two points to hold pencils. A gauge of this type, having the dimensions indicated in the drawing, can be used on timbers 12 in. square or less. If a larger timber has to be marked, the gauge should be made correspondingly longer, say, 24 in. between points, the other dimensions also being doubled. The marking is done by holding the points firmly against opposite sides of the timber, and bearing down on the pencils, which are drawn over the surface of the timber as indicated.

¶Do not use wedges under shaper or planer work: use flat shims as these do not slip when the tool is taking a heavy cut and the work tends to vibrate.

Make These CANDLE-

RADICALLY different from the usual types of wooden candlesticks of the better grade that can be obtained at art stores, antique shops, etc., the "helical" candlestick shown in the accompanying drawings will present a pleasing appearance, in good taste on any mantel. The feature that is especially appealing is the symmetry of the spirals. Both are formed from a single piece of wood, a task which seems exceedingly difficult but is much easier than might be supposed. Only patience and care are required in doing the work, and any person who has a small wood-turning lathe, a coping saw, a metal hand drill and a few other common tools, can readily make the candlesticks.

It is absolutely necessary that a tough, close-grained wood be used. Mahogany, for example, was found entirely unsatisfactory, while a good grade of maple served the purpose very well. It is not advisable to turn the whole candlestick out of a single piece of wood, as the base and the drip flange will not be so strong nor show the beauty of the grain as is the case when it is made out of separate pieces as described in this article. The four parts are the base, the central section or body, the drip flange and the cup, these parts being finished separately, doweled and glued together securely and then gone over at the joints to insure smoothness and continuity of line. Accordingly, 2 by 6-in. maple will be satisfactory, and although the shortest stock available at lumber yards is usually about 10 ft. in length, it is well to have extra stock on hand in case some of the work is accidentally spoiled. A piece of 2 by 6-in. maple, 10 ft. long, costs about $2.50.

In making a pair of candlesticks of this kind, cut off two pieces 6 by 6 in. square; set up in the lathe and turn them down to form the bases, using a template in order to get both exactly alike in contour, height and width. Sand them down carefully until no tool or sandpaper marks can be seen on the surfaces. The dimensions and the curve of the base are given in Fig. 1. The center sections are turned according to the measurements in the same drawing. The pieces used for this purpose should be about 2 by 2 by 10 in. and are turned down to 9 in. in length, 1¾ in. in diameter at the bottom, and 1½ in. at the top. A neck is turned on the top end where the drip flange is attached. This end should be turned to ¾ in.

Attractive STICKS

By E·R·Haan

diameter and, when the flange and cup have been doweled on, which is done after the center section has been entirely completed, it can be carefully turned down to 5/8 in. Two 6 by 6-in. pieces are turned down for the drip flanges, a length of 2 by 2-in. stock is turned to 1½ in. in diameter, and the cups or candle holders are turned and finished, care being taken to make them exact duplicates.

The following method of turning the various parts has proved convenient. For the base, drill a hole in the center of the 6 by 6-in. blocks, cut off the corners at a 45° angle and attach the block to the screw faceplate of the lathe. The hole, which should be drilled just a trifle smaller than the screw on the faceplate, should extend entirely through the block so that the dead center of the lathe can be butted into the hole. Thus securely supported on both sides, the block will not chatter or get out of alinement. If the top and bottom sides are not perfectly parallel, face one side, then reverse the block and turn the other side. The neck part of the base should not be finish-turned until after the center section has been finished and doweled on. The center section is drilled lengthwise at both ends, at one end for the screw of the faceplate and at the other end for a 3/8-in. dowel, by means of which the drip flange and cup are attached later. The drip flanges are turned down in the same manner as the bases, a small hole for the faceplate screw being first drilled, the corners cut off and, after the base is completely finished, a 3/8-in. hole is accurately drilled all the way through it. In making a cup, the hole for the candle is bored first, to a depth of about 1 in. and not more than 3/4 in. in diameter. Similarly the 3/8-in. dowel hole in the bottom, 1/2 in. deep, should be drilled before the cup is turned to shape. The wood may split if the cup is first turned and then drilled. A steady rest will be of use when boring the 3/4-in. hole.

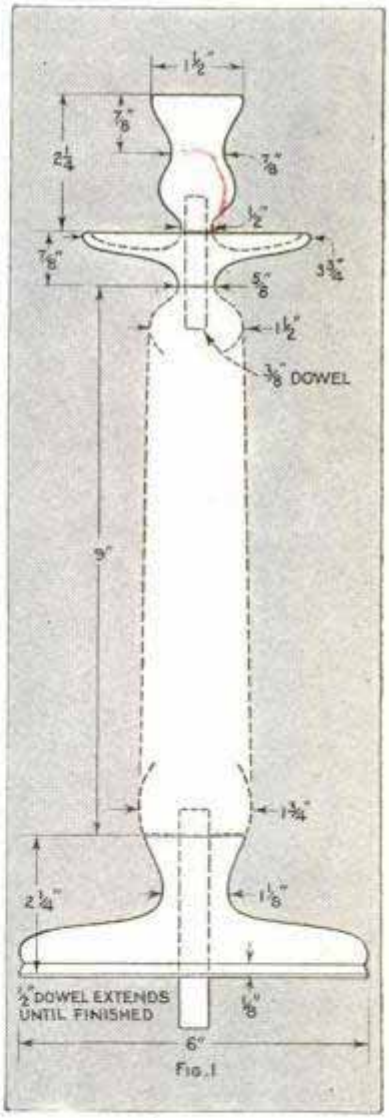


Fig. 1

After the individual parts of each candlestick have been turned and finished, except at the ends where they join, the center section is taken and two strips of gummed tape, ½-in. wide, are wound around it as indicated in Fig. 2. The strips are wound around exactly 2½ turns and must be equidistant at all points; the starting points of the strips

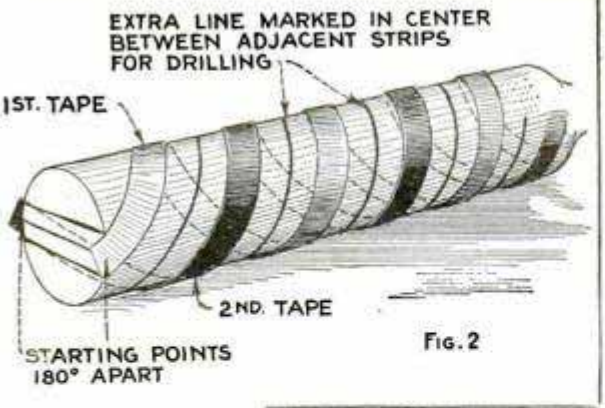


Fig. 2

are diametrically opposite each other at the lower end, that is, 180° apart. An extra line is marked in the center of the wood exposed between the strips to serve as a guide for drilling, which is done by means of an ordinary metal hand drill, using a ½-in. drill. It is necessary to drill holes through the center piece at various points and the holes must be drilled exactly at right angles to the axis, not to the surface. A good method of drilling the holes is shown in Fig. 3, a simple wooden jig being used to hold the work and to guide the drill. Although this method takes some time, it is accurate.

The exact construction of the jig is shown in Fig. 4. It consists of a base, two sidepieces with vees cut in them to hold the round piece securely, and a top piece. The sidepieces are made from ¾-in. wood and are cut the same dimensions, except that one piece is exactly ⅛ in. higher than the other. Clamp the two pieces, with the top edges flush, in a vise, and saw out the vees, which have previously been laid out. The vees should be just deep enough so that the work will be raised about 1/16 in. above the top of the sidepieces. The latter are screwed to the base, 7 in. apart, the screws being driven up from the underside of the base. Nails are not used as they might split the sidepieces. The top piece has a row of ½-in. holes drilled lengthwise in the center. After the work is laid in the vees, the top is screwed on as indicated, and will hold the work securely. It must be remembered that one sidepiece is ⅛ in. higher than the other to allow for the taper, and the end of the work having the 1½-in. diameter should rest on the highest piece. The row of holes in the top must be centered accurately over the work. Then, before clamping the top on the work, arrange the center guide line between adjacent strips to come directly under the center of a hole. Proceed to drill through the work slowly in order to avoid splintering the wood as the drill comes through. Turn the work a trifle and drill another hole, adjacent to the first, and also centered on the

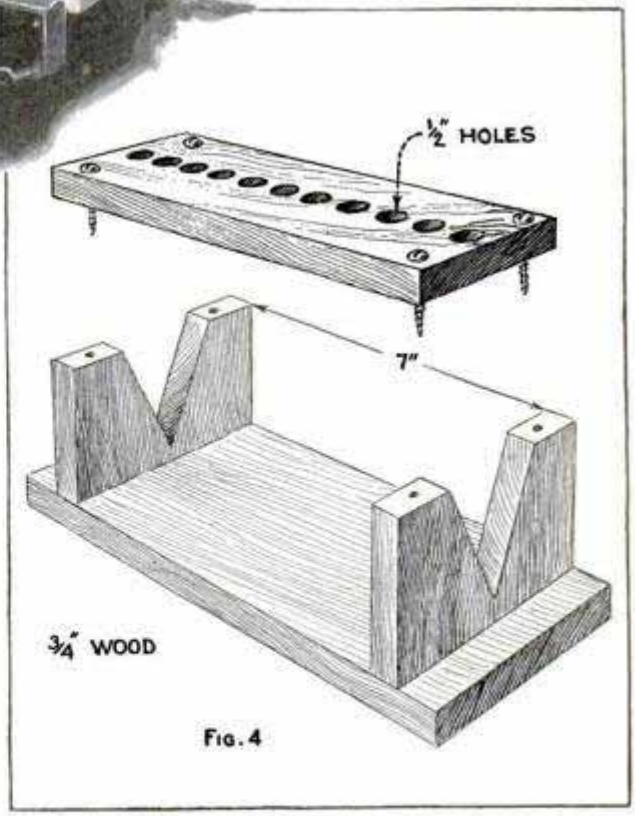
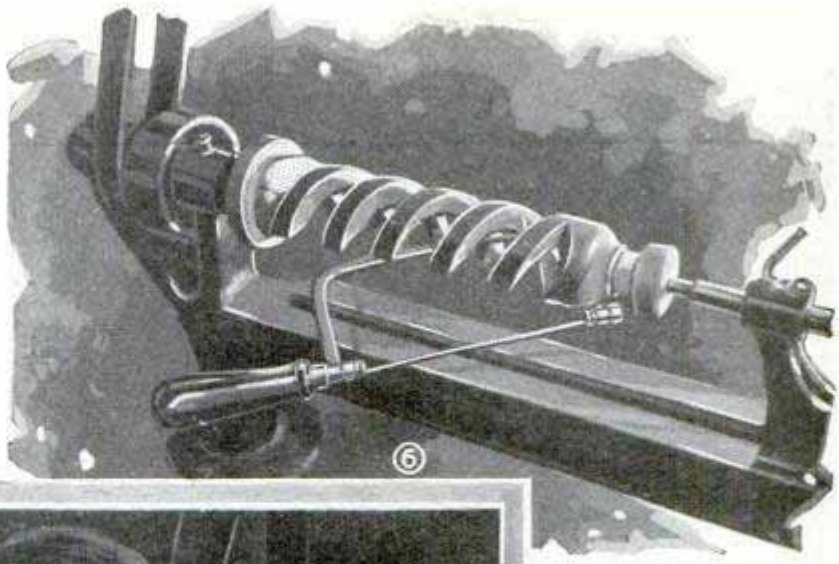


Fig. 4

guide line. In this way holes are drilled through the work to remove the bulk of wood between the helices. Do not drill closer than ½ in. from the bottom end and about 1 in. or so from the top end.

After the work has been drilled, it is set up in a lathe and the remaining wood is carefully cut away by means of a coping saw, as shown in Fig. 5. When doing this, guide the blade of the saw toward the waste wood. If you saw straight down a cut will be made in the wood forming the helices, and this should, of course, be avoided. Cut as much wood off in this way as possible and then take a round file and dress down the ragged sides of the helices evenly, which will give the work the appearance shown in Fig. 6. The rounding of the helices is the next operation and this is a good deal easier than you may think. Get a number of strips of ¾ or 1-in. emery cloth, rather coarse, and dress down the helices by partly wrapping a strip of the cloth around a helix and drawing it back and forth as in Fig. 7. Do not pull too hard or the work will break. Sand equally over the helices to get them perfectly round. After the corners are taken off with coarse emery and the helices have assumed a round shape use a finer grade of emery or sandpaper and lastly fine steel wool to smooth off all scratches. The sections where the ends of the helices join must also be sanded down carefully. When completed, enlarge the hole in the base and in the lower end of the helical section, and dowel and glue the two pieces together. Then dowel and glue on the top parts. The ½-in. dowel in the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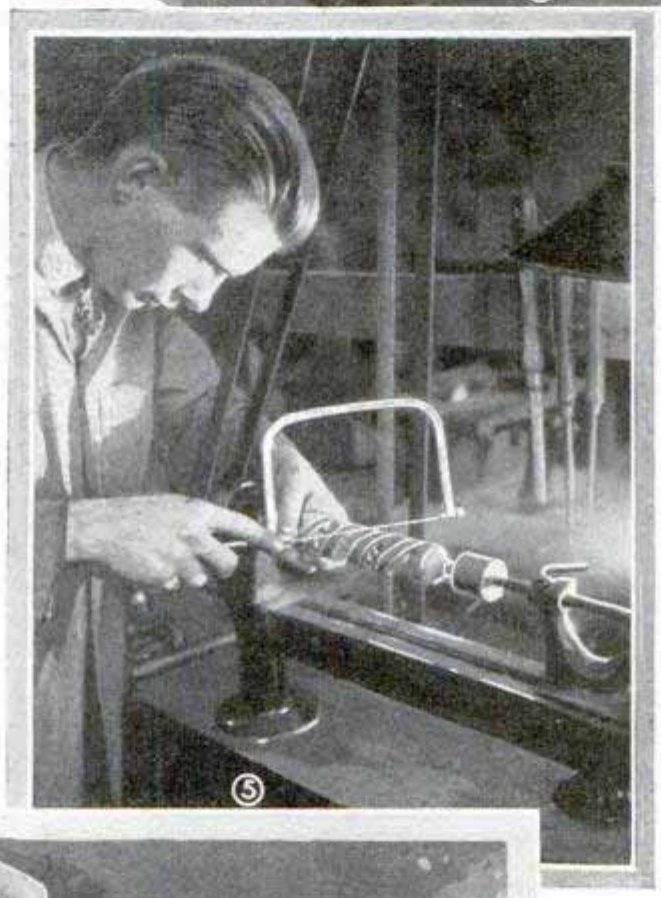
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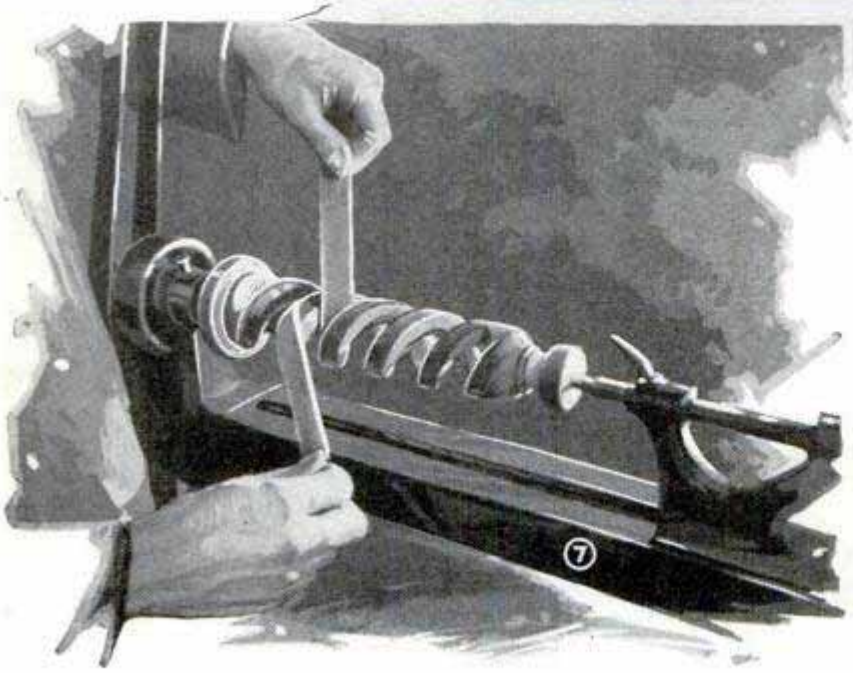
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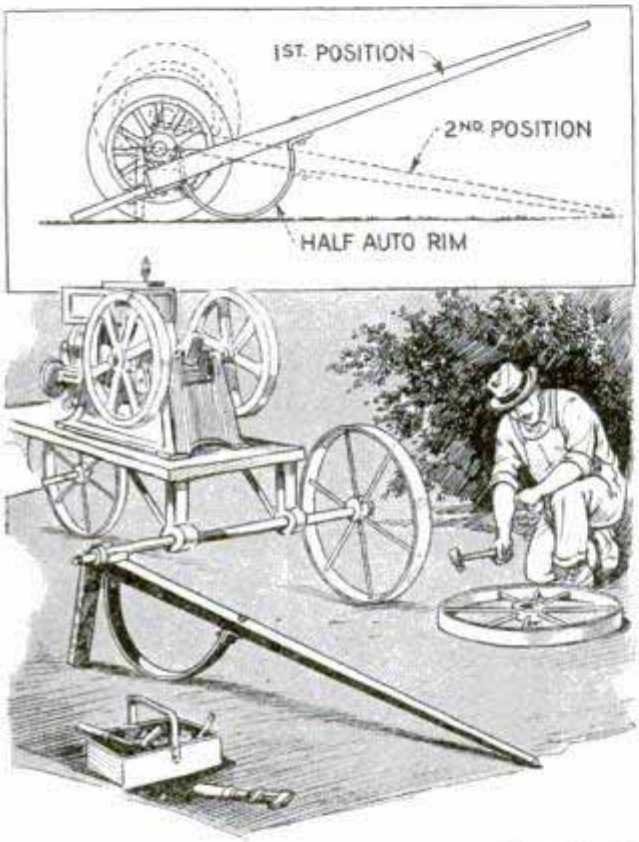
base should be left extending, as shown in Fig. 1, so that it can be used to hold the work in the lathe chuck. After the candlestick is entirely completed, the projecting end of the dowel is cut off. The joints between adjacent pieces should be well finished. Sandpaper or steel wool can be used to remove all scratches.

Use a light-oak wood dye to get a colonial-maple effect. Do not use the shellac first as it will spoil the finish. Before the stain has dried, wipe off the high lights and then finish with a coat of white shellac. After this has dried thoroughly, rub it down with finely powdered pumice-stone and oil, just enough to remove the luster and the brush marks, if there are any. Then apply polishing wax, which, after being rubbed down, will give the sticks a pleasing satin finish.



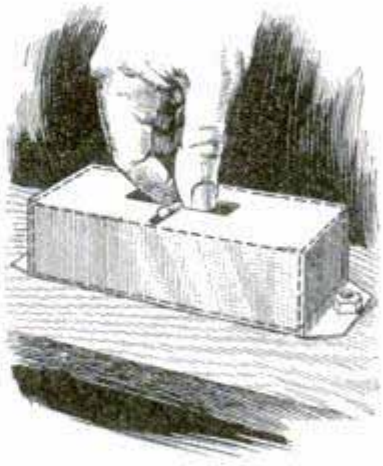
Simple Jack Facilitates Greasing and Repairing Wheels of Farm Wagons and Implements

Handy Homemade Jack

The drawing shows a type of lifting jack, which, although rather unusual in design, is nevertheless quite simple to make and use. It consists of a length of 2 by 4-in. wood as a lever, a half auto rim, a piece of 1-in. wood, hinged to the end of the lever, and a length of flat iron bent to a shallow "U" and bolted to the lever at the same end. The illustration shows how these parts are assembled, and the upper detail indicates the method of using the jack. It is especially useful on the farm to jack up wagons and farm implements when greasing the wheels or making repairs. In use, the U-shaped piece on the end of the lever is brought under the axle, while the rim is set on the ground. A little pressure on the lever will quickly raise the load and the hinged piece will drop to a vertical position, holding the load securely.

A Safe Match Container

Many shops object to keeping matches around to light up gas furnaces, blow-torches, and the like, because of the danger and the fact that some men are apt to help themselves rather generously for their own private use. Both these objections can be easily overcome by adopting the container illustrated, which holds matches safely and prevents more than one or two from being taken out at the same time. It is made of tin and is large enough to cover the inner half of a box holding about 500 matches. It has one slot cut out on top for the insertion of the thumb and forefinger and one at right angles to this for the removal of the matches. The container is held by means of a couple of screws and nuts in any convenient position. With the thumb and finger in the slot, the matches can be removed only through the narrow slot, which permits the passage of two matches at the most.

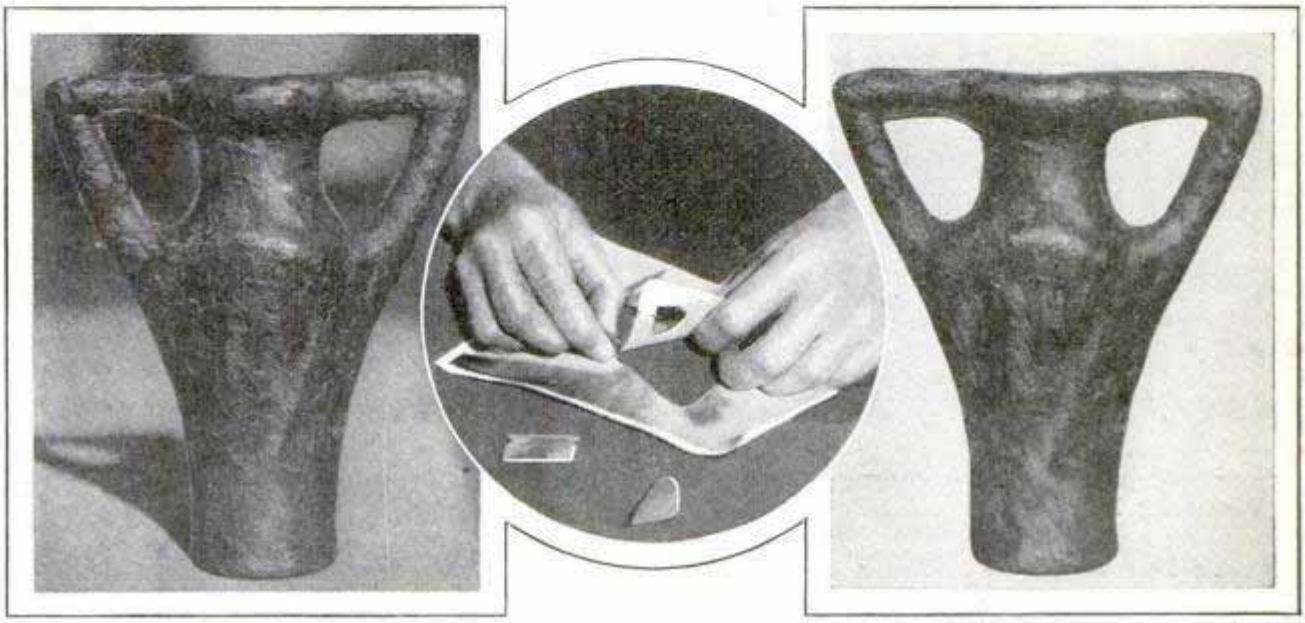


¶ Never brush chips into the running parts of a machine; use guards, if necessary, to keep the chips out.

Blocking Out Photo Backgrounds

By DICK HUTCHINSON

BLOCKING out the background of a negative is a tedious operation, and it is a hard matter to get a satisfactory job without allowing the brush to slip on some of the long lines, thus blocking out a margin of the picture itself and spoiling an otherwise good negative. For the commercial photographer, or anyone who has a lot of blocking-out to do, the following method will be found useful:



Left, Photo in Which Background Causes a Loss of Contrast; Right, Background Blocked Out to Give Contrast; Center, Cutting the Photo Out of the Background

Place the negative to be blocked out in the printing frame and make a contact print on single-weight paper; develop, fix and wash in the usual way. While wet, place the print, face up, on a drawing board or some other smooth surface and cut out the picture along the outline with a safety-razor blade, care being taken that a good even outline is obtained. Put the cut-out part, face downward, on the original negative and press it down evenly all over, thereby covering all of the negative except the picture, or the portion that is to be printed. The moisture still in the paper will make it stick to the negative. Place in the printing frame and proceed to make prints. These will have a pure white background, which is seldom attained with the old method of blocking out.

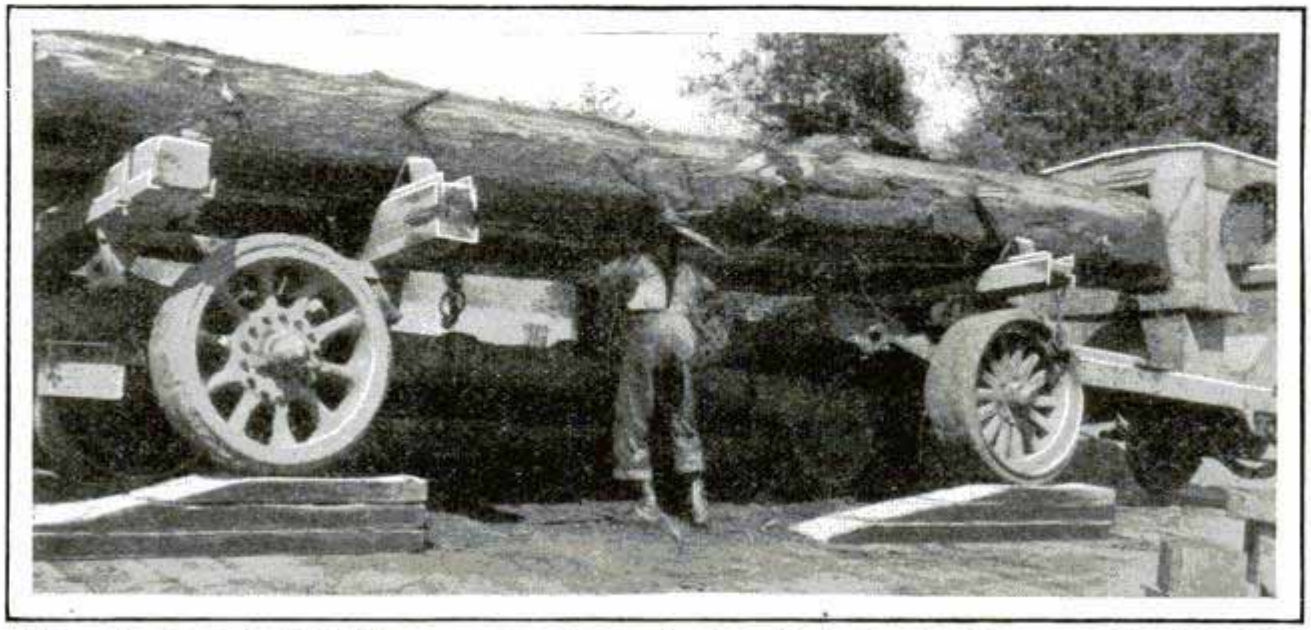
A black background is often desired, and is especially suitable with photos of statuary, etc. The following is the simplest and most satisfactory method of getting this effect: Develop, fix and wash the negative and let it dry thoroughly. Then take a safety-razor blade with a good sharp corner and cut through the emulsion all around the subject. Place in water again and let it soak for an hour or so, then remove, and with the razor blade scrape off all the emulsion outside of the lines, leaving only the subject itself. Let dry thoroughly and the negative is ready for printing. The prints should show a good sharp picture, with a clear black background.

Use for Vacuum Cleaner

Tool cabinets and their drawers collect considerable dust, mainly because many people consider it too much trouble to remove the small pieces in order to clean up. I keep my entire cabinet dustless by using a vacuum cleaner. From a piece of ordinary wire fly screen, I made a cover to fit snugly over the opening or mouth of the small nozzle used with the hose attachment. With this arrangement the nozzle gets into all corners and among small parts, sucking up every particle of dust.—Walter C. Michel, Jersey City, N. J.

Unloading Logs from Trailer

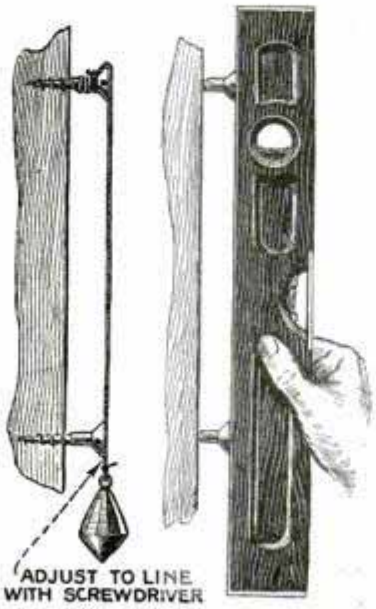
Three planks, nailed together and beveled on one end so that a trailer carrying a load of logs can be pulled up on them, as indicated in the photo, have been found very useful to help unloading. The driver first loosens the chains holding the logs and then drives the trailer on the blocks so that it is tilted to one side. This causes the logs to roll off quickly.—Carlton Groat, The Dalles, Oreg.



Timesaving Method of Unloading Large Logs from a Truck Trailer by Running It onto a Pair of Beveled Blocks to Tilt It Sideways

Simple Rig Checks Accuracy of Level

All levels sold in hardware stores are supposed to be accurate, but unfortunately there are many grades of levels, and some of these do not come up to this requirement. In the drawing is shown a simple method of checking a level in a few moments. Drive a flat-head screw into any post or side wall and suspend a plumb line, as indicated. About 2 or 3 ft. below this screw, drive in another screw so that the head will be exactly in line with the plumb line. All that is necessary now is to place the level against the screws for checking, as shown in the right-hand detail.—L. H. Georger, Buffalo, N. Y.



Care of Pneumatic Tools

The life and efficiency of a pneumatic tool depend to a great extent on the care it gets. A clean air supply is necessary, and therefore it is a good idea to blow air through the hose pipe before connecting the tool, in order to remove moisture and dust. After use, a pneumatic tool should have a charge of suitable oil blown through it to remove any moisture, cover the metal parts and protect them from rust. All tools should be returned to the storeroom after the day's work. They should never be left in the open all night, as this will cause corrosion and consequent loss of efficiency. Tools should be placed in a kerosene bath once a week to clean them. Upon removal from the bath, they should be dried thoroughly and lubricated plentifully before use. Shanks of snaps, chisels, drills and reamers must be of exactly correct dimensions, as chisels and snaps with defective shanks are apt to ruin the hammer piston. Likewise, if drill shanks become bruised, bent or otherwise damaged, they will not fit the socket of the drill accurately. The result will be a damaged socket and perhaps a broken drill.

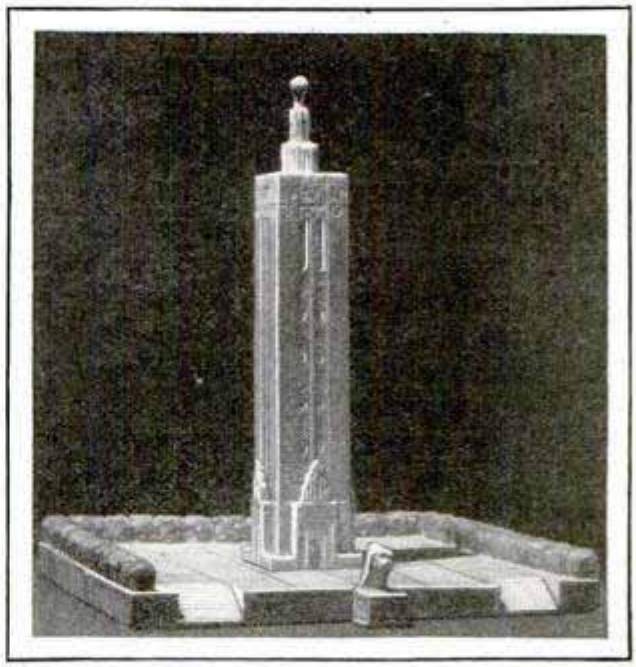
Only light oil should be used for the hammers and a good grade of heavy oil for drills.—August Jeffers, Philadelphia, Pa.

Atomizer Used for Oiling Firearms

Every sportsman knows that rust is highly injurious to firearms, fishing tackle and other sporting equipment, which must receive proper oiling and care to remain in good condition. In fact, more firearms go to the scrap heap every year from rust than are ever worn out by use in the field. The writer has quite a collection of firearms, and, in spite of the best care, they have suffered a slight depreciation from rust. Oil, of course, is the antidote for rust, but there are two problems to be met in keeping firearms properly oiled. One is to use the right kind of oil, and the other the method of applying it, for the oil must get into every crevice. Any special grade of good gun oil is suitable for rust prevention, but it cannot be applied satisfactorily with a cloth or with an oilcan. The application problem is solved in a satisfactory manner by the use of an old nasal atomizer, by means of which the oil can be sprayed into all the cracks and corners of the gun mechanism. The atomizer has a flexible nozzle which permits spraying the gun oil into the receivers of rifles and other parts of firearms that cannot be reached with any oilcan. It is also useful

Oiling Firearms with an Atomizer Insures Getting the Oil into All the Crevices

for spraying ferrules of fishing rods, metal parts of artificial fishing lures, and practically every other kind of sporting equipment which needs oiling.—John Edwin Hoag, Los Angeles, Calif.



Soap Has Been Used Successfully as a Medium for Architectural Models

Architectural Models Made from Soap

Standard cakes of white soap were used to make the architectural model shown in the photo. The surface of the cakes was cut smooth by means of a heated knife. The cakes were held together and grooves were cut on the sides where they joined. Soft soap, made by melting some of it, was poured into the groove and the cakes were pressed together firmly and allowed to stand for several hours. The result was a mass of soap of uniform consistency, which was easy to carve. This was done by means of a steel tool and an orange stick.—Henry Bern, Chicago, Ill.

Cutting Cast-Iron Soil Pipe

There is a trick in cutting soil pipe, especially when it is in the shape of a bend or elbow. First mark or score it where you wish to cut it. Then place a piece of 2 by 4-in. timber on edge. Have some one hold the bend by the end to which the collar is attached, and rest the part to be cut on the timber. Tap the pipe in several places on the scoring with a cold chisel and hammer, letting the helper rotate the pipe as you do this. With care and not too heavy blows, the material will break off clean along the mark.

¶In knurling a piece of work apply oil on the working face of the roll and also on the pin.

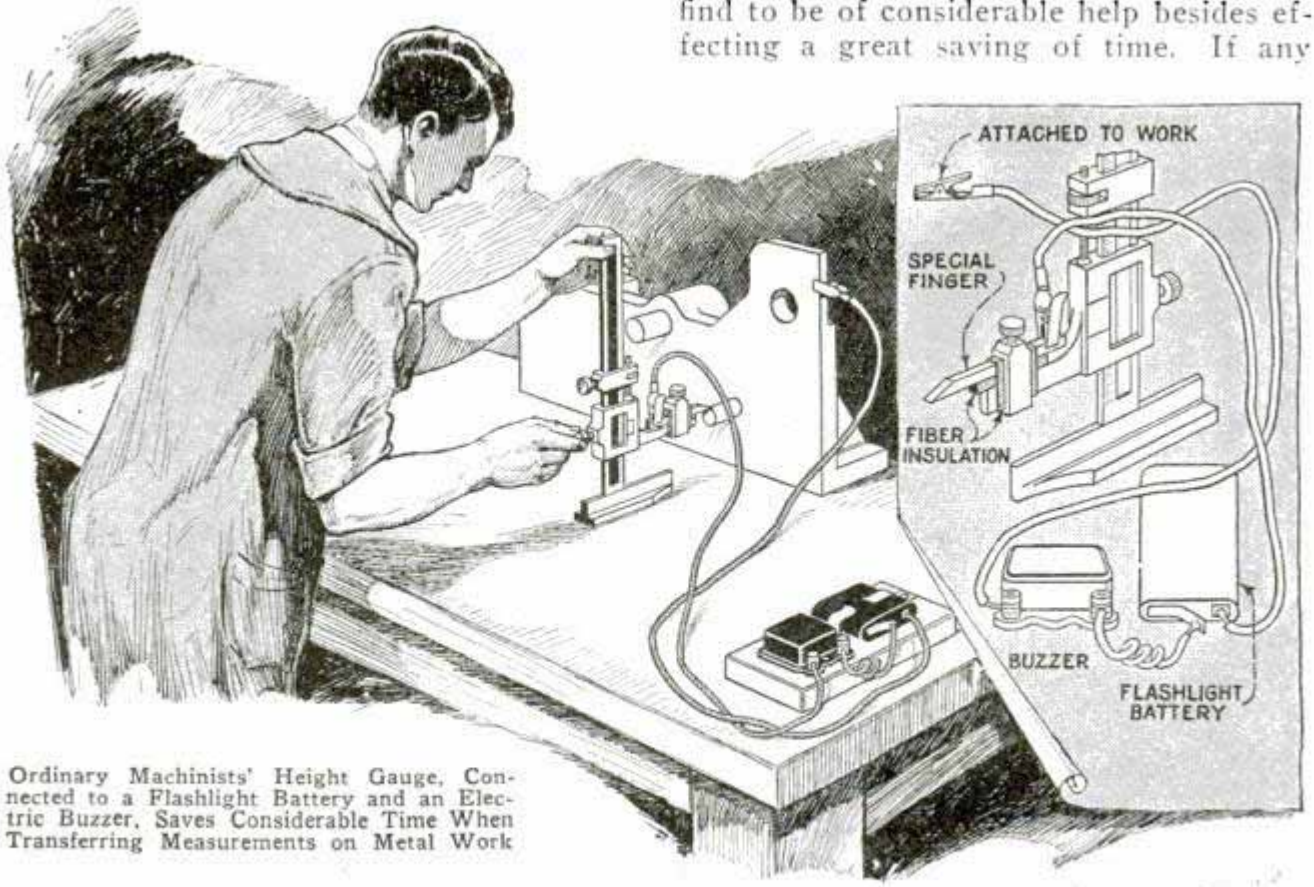
An Electrical Height Gauge

By JAMES McINTYRE

ACCURACY in using a height gauge usually depends on the sense of feeling. Some machinists, however, use Prussian blue on the measuring or transfer finger, noting the transference of this blue onto the point or object being measured, and in this case accuracy depends on sight. Both of the foregoing methods take considerable time, and the novel method illustrated in the accompanying drawing, will be found much more convenient, besides being just as accurate as the others. It consists in an arrangement using a flashlight battery and a buzzer, the latter being energized the moment a circuit is completed by the transfer finger making contact with the work.

Any height gauge can be equipped for this purpose by simply inserting a piece of electrical insulating material at the points indicated. In my case, I made a special finger, half the width of the one provided on the gauge, and then inserted a piece of fiber under it. The part that clamps the finger must also be well insulated to make a complete break in the circuit. The reason for this careful insulation is that the metal surface plate, or table on which both the gauge and the work are set for measuring, provides a path for the current and this would keep the circuit closed at all times. However, if a piece of plate glass is used as a surface plate, it is not necessary to insulate the gauge, and the wire can be attached to it at any convenient point by means of a spring battery clip. One length of insulated copper wire is connected to the transfer finger and to the flashlight battery; another is provided with a spring battery clip, which is clamped to the work, and this wire is connected to a terminal on the buzzer. The battery and the buzzer are connected as shown in the detail. If no buzzer is handy, a flashlight lamp will answer the purpose, or a radio headset can be used. As soon as the finger makes contact with the work, the buzzer will sound, the lamp will light or the headphone will "click."

Anyone can readily improvise an arrangement of this kind, which he will find to be of considerable help besides effecting a great saving of time. If any



Ordinary Machinists' Height Gauge, Connected to a Flashlight Battery and an Electric Buzzer, Saves Considerable Time When Transferring Measurements on Metal Work

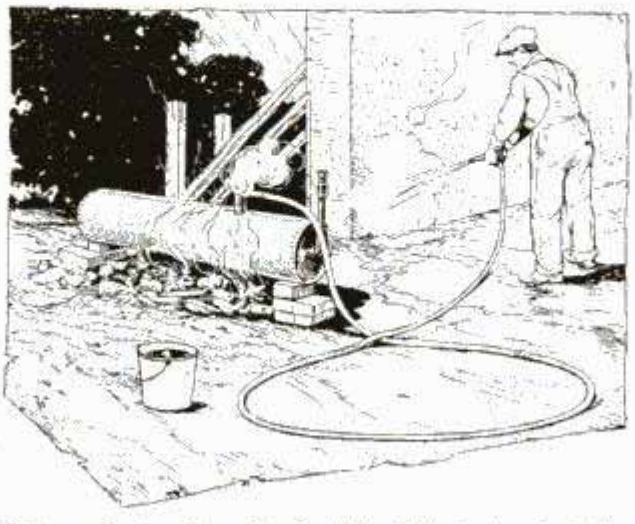
machinist or toolmaker desires to have his gauge arranged so that no addition is necessary when making measurements, all he has to do is to grind a shoulder on the back of the measuring finger, and to use a piece of insulating material the exact depth of this shoulder.

Salt as a Milk Producer

A Wisconsin dairyman has discovered that, although it is commonly acknowledged that salt is good for dairy cows, it does not receive the consideration it deserves in making up the regular diet. In comparative tests with two herds containing an equal number of cows, the farmer claims that the first herd, which was given access to salt at all times, consumed 25 per cent more water than the second herd, and the milk flow increased from 12 to 15 per cent, while that of the second herd remained practically the same. To give milk in any quantity, a cow must consume more water than her bodily health requires and salt must be provided at all times.

Melting Snow and Ice Quickly

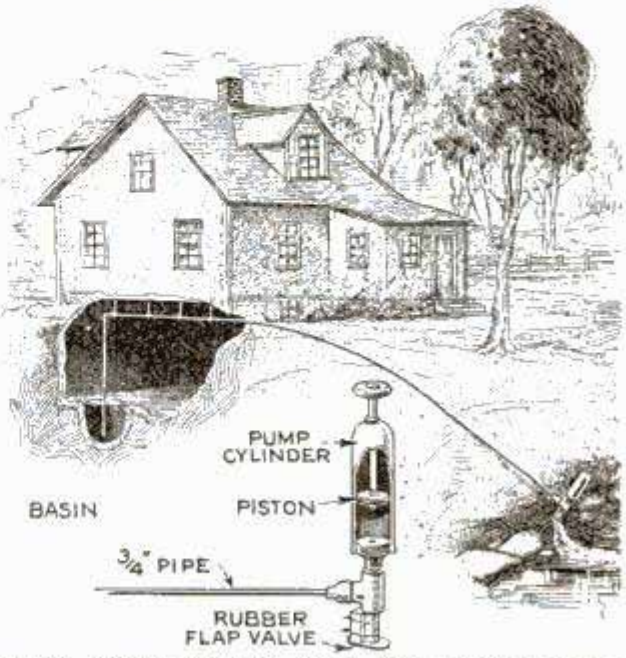
Sometime ago, during the winter, we were building a concrete dam, having a gas-engine concrete mixer on the job instead of a steam-power mixer. We had no way of removing the ice and snow from surfaces where fresh concrete was to be poured, so we used an old range boiler in the manner indicated in the drawing. It was raised from the ground by setting the ends on stone or brick supports. A filler pipe was arranged at the end, as shown, the tank was filled about two-thirds with water and a length of hose was then connected to the tank by means of a short pipe nipple. A fire was then built under the tank and the steam produced was directed against the snow and ice.—A. C. Brundage, Rochester, Minn.



Snow and Ice Can Be Quickly Melted by Applying Steam from This Improvised Boiler

Draining Cellar with Siphon

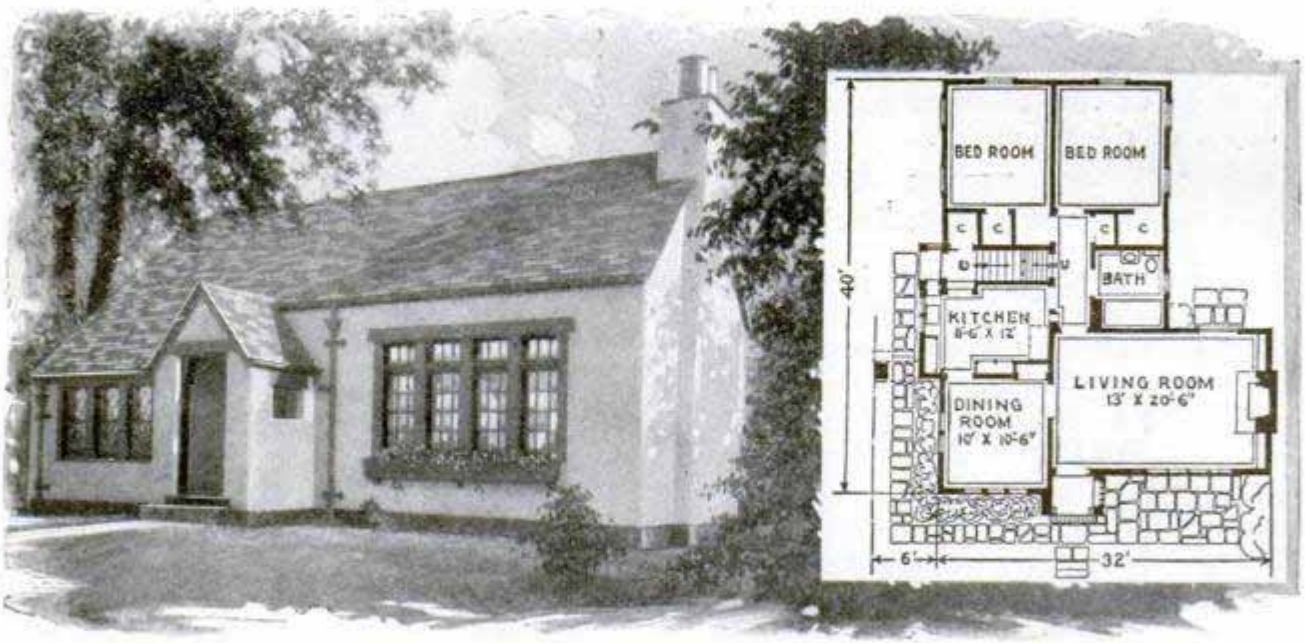
There was quite a bit of water in my cellar. Being unable to drain it and not having a pump, I struck on the siphon



Simple Siphon Made of ¾-in. Pipe Quickly Drains Water from Cellar

idea illustrated in the accompanying drawing. The house was situated on a slight rise of ground, which enabled me to extend the outside section of the siphon to a lower level than the cellar floor, for otherwise the siphon would not work. A number of lengths of ¾-in. pipe were coupled together, using lead in the joints to make them air-tight. A hand pump and a rubber flap valve were provided on the outside, as shown in the detail. The water flow was, of course, started with the pump. As soon as the water reaches the outlet, it will keep on flowing as long as the inside end of the pipe is immersed. It is a good idea to fit a short piece of rubber hose on the inside end of the siphon and extend this to the lowest point on the cellar floor in order that the water may be drained out completely.—Luther Strosnider, Onaga Kansas.

Is This Your Home?



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Plan No. 5D35

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THERE are plans without number for five and six-room bungalows, but two particular arrangements have the strongest appeal, especially where economies are in order. In one of these the living quarters of the house are separated from the sleeping rooms and bathroom by the wall that runs down the center from front and back. Thus living room, dining room and kitchen are arranged on one side, with bedroom, bath and second bedroom on the other. The other scheme is to have living room, dining room and kitchen in front and two bedrooms in the rear.

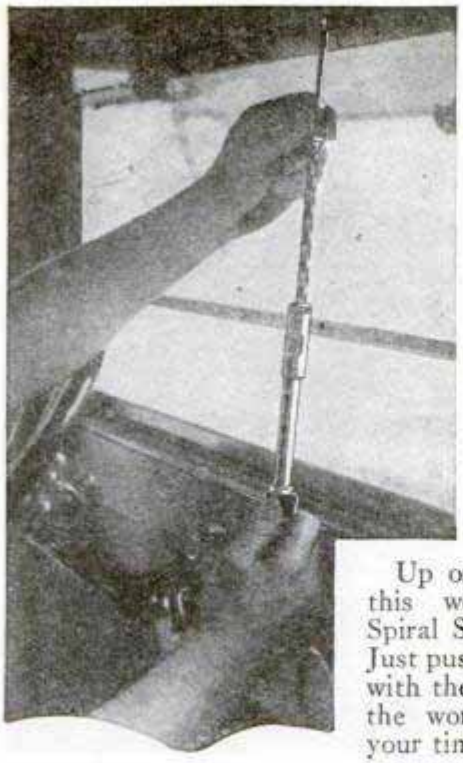
The design shown here is the second of these schemes, but only in the most general way. Changing the direction of the living room, for example, is a variation which seems to make a completely new plan scheme. There is the separation between living quarters and the more private quarters of the house, which should be possessed by every bungalow.

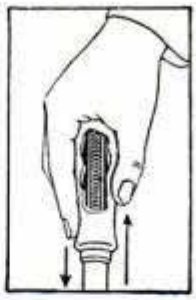
Undoubtedly the most distinguishing feature is the living room with its high ceiling. This has sometimes been called a studio-type room. The rafters form part of the ceiling. This makes possible the use of a large window in the front wall and adds a sense of luxury and spaciousness at small expense. The qualities of this room have been heightened by making a decorative feature of the bookcases. These have been built at each side of the fireplace in line with the mantel and with it form a band of decoration across this end of the room. The enjoyment of the family will be increased by the generous opening to the rear upon the garden view.

Dining room and kitchen are well arranged, completely equipped with the facilities that make toward convenience in housekeeping. The location of the kitchen with respect to the grade entrance and basement stairway will appeal to efficient housewives.

A terrace may be arranged at the side of the entrance and before the living room and a porch or sun room may be built in the corner back of the living room.

Construction: Wood frame; exterior finish stucco.





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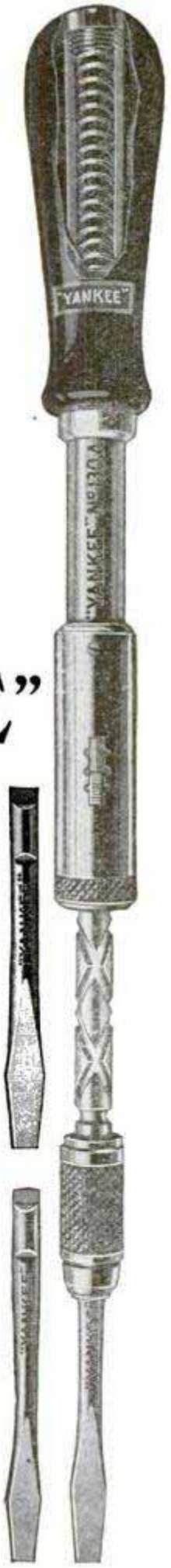

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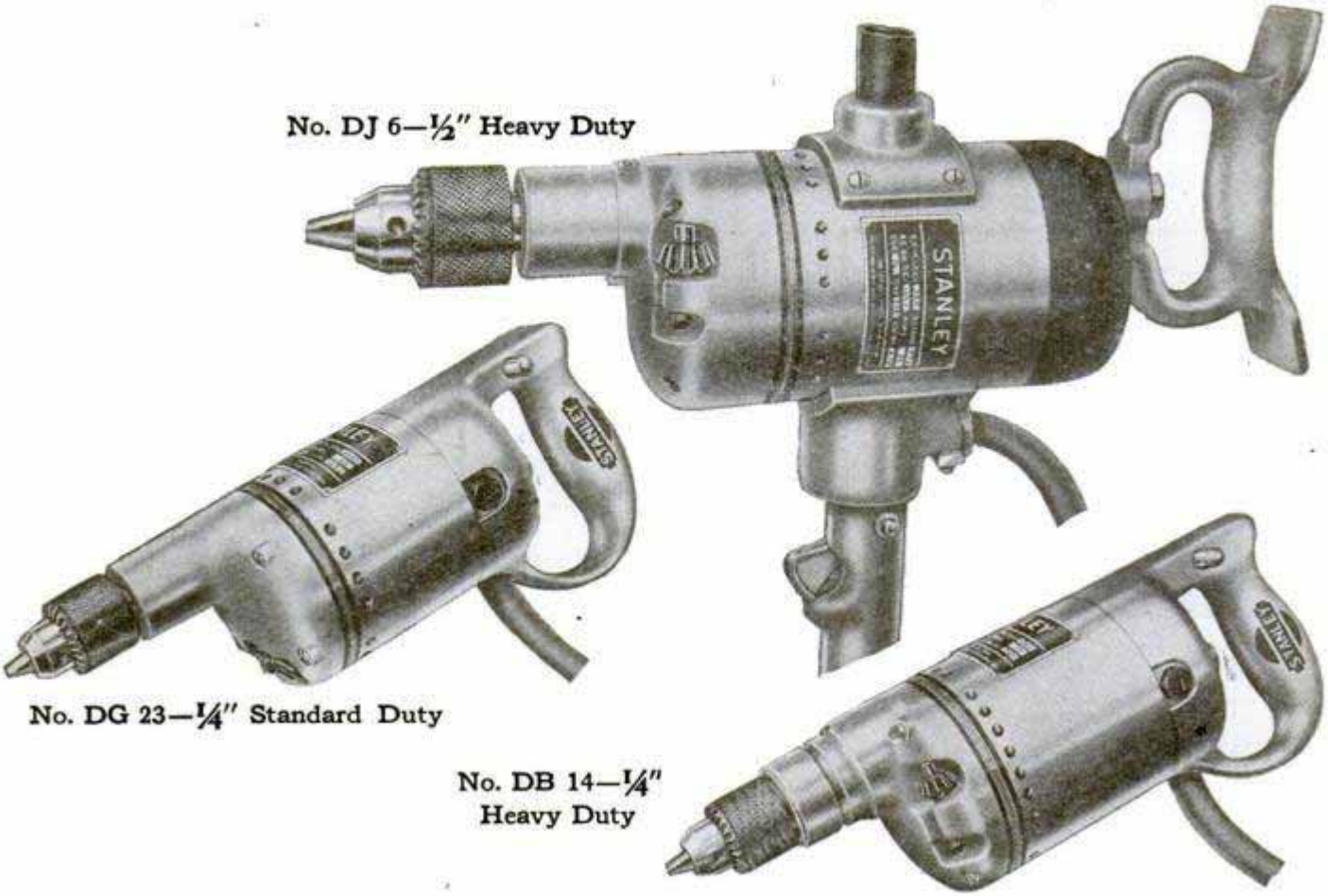

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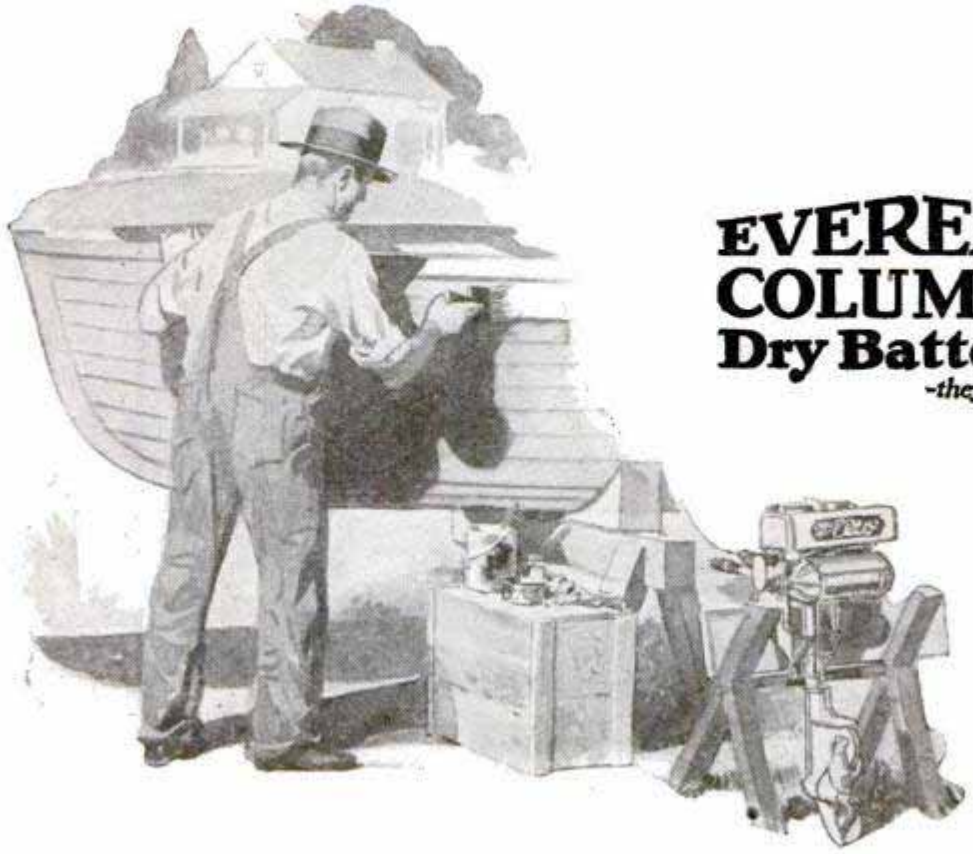

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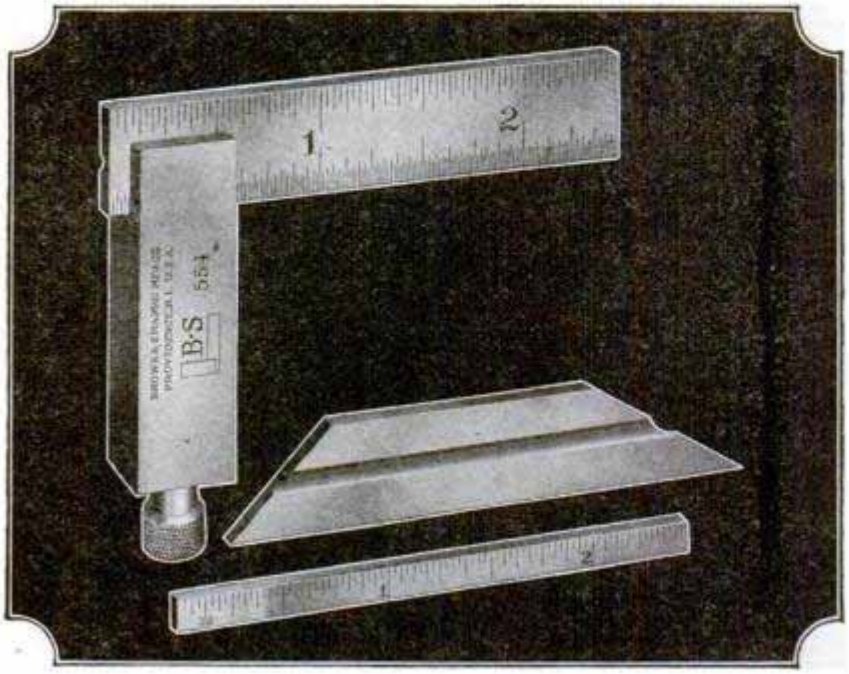

Adjustable Square No. 554 has blades which may be adjusted to any length and are reversible. This square can be used in places where it would be impossible to use a square with a fixed blade. Complete tool includes blade shown in square, blade for narrow slots and bevel blade for 60° and 45° angles.

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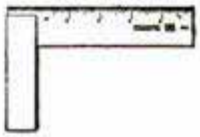

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More than a million are riding with ETHYL

IT took seven years to develop Ethyl Gasoline—but it took only months for the motoring public to discover its advantages.

Today more than a million car owners are riding with Ethyl. They are enjoying a new standard of engine performance—more power on hills and heavy roads, faster pick-up, reduced gear-shifting, a cooler, smoother motor under all driving conditions. And to the owners of the new high compression automobiles, Ethyl is giving a still bigger thrill.

The price of Ethyl Gasoline is simply the price of good gasoline, plus the few extra pennies the Ethyl ingredient costs. Look for the "ETHYL" trade-mark on the pump.

ETHYL GASOLINE CORPORATION

25 Broadway, New York City

ETHYL GASOLINE

Facts about Ethyl Gasoline

ETHYL GASOLINE was developed by General Motors Research to provide a more efficient fuel for internal combustion engines.

It is formed by adding Ethyl brand of anti-knock compound ("ETHYL" fluid) to selected motor gasoline in an amount sufficient to utilize the higher compression created by carbon deposits or advanced engine design.

"ETHYL" fluid is a concentrated liquid containing tetra-ethyl lead which has the property of controlling the combustion rate of gasoline. It is a patented product.

Ethyl Gasoline is colored red for identification. The color has nothing whatever to do with its performance. It takes more than dye to make "anti-knock" gasoline.

Ethyl Gasoline increases the performance of any automobile engine—whatever its compression—whatever the climate or other driving conditions.

If your car is designed to operate on ordinary gasoline, the use of Ethyl Gasoline will:

Eliminate "that knock" and power loss.

Make carbon deposits a source of extra *power. For carbon increases compression and Ethyl Gasoline is* the *high compression fuel.*

Give a smoother and better pulling engine, particularly on hills and heavy roads.

Reduce gear-shifting and increase acceleration, thereby making traffic driving easier.

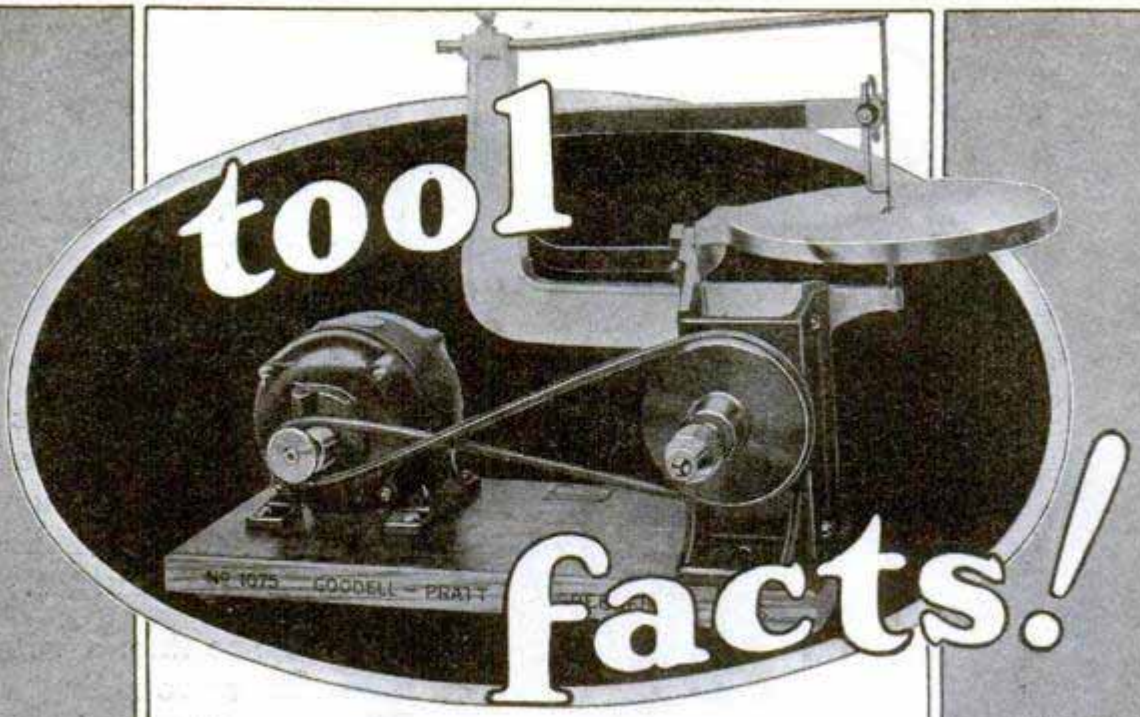
Cut down vibration, thereby reducing engine wear and tear and depreciation.

Save you the expense of carbon removal and other repairs caused by "knocking" and carbon formation.

Give more power per gallon for your fuel bills—and more mileage as compression is increased by carbon deposits.

If your car is a high compression car, just remember that Ethyl Gasoline made it possible and its use is necessary to obtain maximum performance.

Ethyl Gasoline is the yardstick by which other gasolines are measured.



You *can* afford this Motor Driven Scroll Saw

Aside from the joy in owning such a tool—one you've wanted a long time—from the standpoint of economy alone, you'll find it a good investment. You have two or three jobs now that this No. 1075 Scroll Saw will enable you to do yourself and not have to have done. A considerable portion of the cost of the saw will be offset by what you'd have to pay to have these jobs done—and you'll have the pleasure of following your bent and doing the work yourself. But better yet, you'll have the saw for the many, many jobs you'll want to do in future. A number of uses are suggested in this advertisement. Other uses are so numerous we could not begin to make a complete list. Being a Goodell-Pratt Tool, it's a *good* tool and will last indefinitely, for the Goodell-Pratt name on any tool is a guarantee of quality and correctness in design.

Ask your local tool dealer to show you the New No. 1075 Motor Driven Scroll Saw *in operation.* If he hasn't one in stock, write us for detailed specifications and price.

Model Building - For cutting out and shaping up innumerable small parts.

Pattern Making - For delicate work on patterns of intricate design.

Jewelry - For roughing out shapes or ornaments of soft metal. A special attachment can be provided to take Jeweler's Saw Blades.

Antique Furniture - For matching odd pieces and parts in restoration work.

Inlaying - For the finest kind of inlay work in both wood and soft metals.

Wood Carving - For cutting out designs for applique wood work.

Cabinet Work - For a great variety of uses, such as cutting grills, ornaments, toys, etc., etc.

Sign Making - For cutting out block letters.

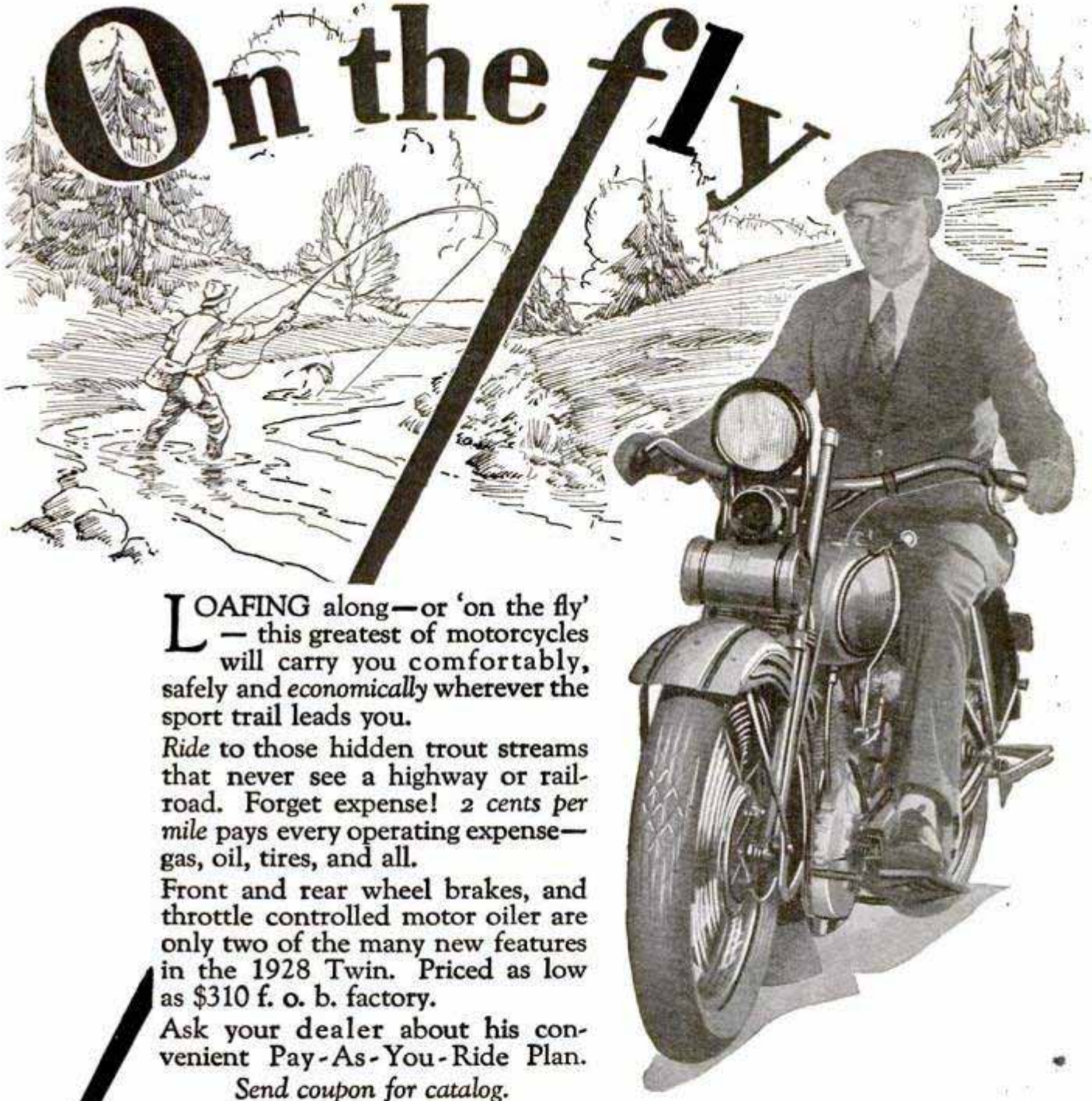
The Mark of a Complete Line of Super-Performance Electric Drills

GOODELL-PRATT COMPANY *Toolsmiths* GREENFIELD, MASS. U.S.A.

GOODELL-PRATT

1500 GOOD TOOLS

On the fly



LOAFING along—or 'on the fly'—this greatest of motorcycles will carry you comfortably, safely and *economically* wherever the sport trail leads you.

Ride to those hidden trout streams that never see a highway or railroad. Forget expense! *2 cents per mile* pays every operating expense—gas, oil, tires, and all.

Front and rear wheel brakes, and throttle controlled motor oiler are only two of the many new features in the 1928 Twin. Priced as low as $310 f. o. b. factory.

Ask your dealer about his convenient Pay-As-You-Ride Plan.

Send coupon for catalog.

HARLEY-DAVIDSON MOTOR COMPANY
DEPARTMENT P. MILWAUKEE, WIS.

The Single

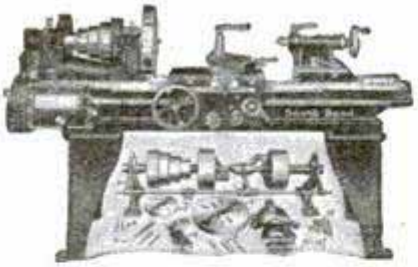
— the famous solo mount that travels 80 miles to the gallon. Only $235 f. o. b. factory, completely equipped.

HARLEY-DAVIDSON *Motorcycles*

HARLEY-DAVIDSON MOTOR CO.
Dept. P. Milwaukee, Wis.

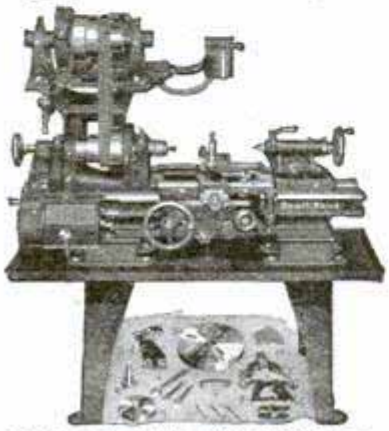
Send me your latest catalog.
☐ I am interested in the Twin.
☐ I am interested in the Single.

Name.....
Street.....
City..... State.....



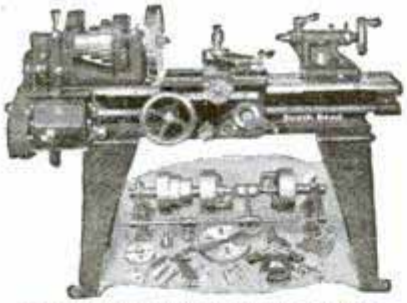
16 inch—Weight 2000 lbs.

Quick Change Back Geared Screw Cutting Lathe, 8 foot Bed. With countershaft and equipment - - - **$570**



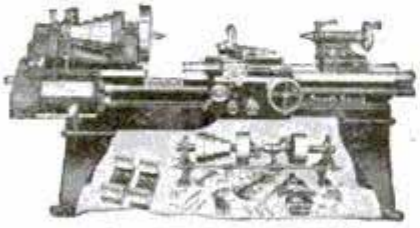
13 inch—Weight 1560 lbs.

Tool Room Quick Change Back Geared Screw Cutting Lathe, 4 ft. Bed. With motor and electrical equipment. Price - - - - - **$525**



11 inch — Weight 675 lbs.

Quick Change Back Geared Screw Cutting Lathe, 3 foot Bed. With countershaft and equipment - - - **$325**



16 inch—Weight 2175 lbs.

Gap Bed, Quick Change, Back Geared Screw Cutting Lathe, 8 ft. Bed. With countershaftandequipment,**$650**

New Model
SOUTH BEND LATHES

for the

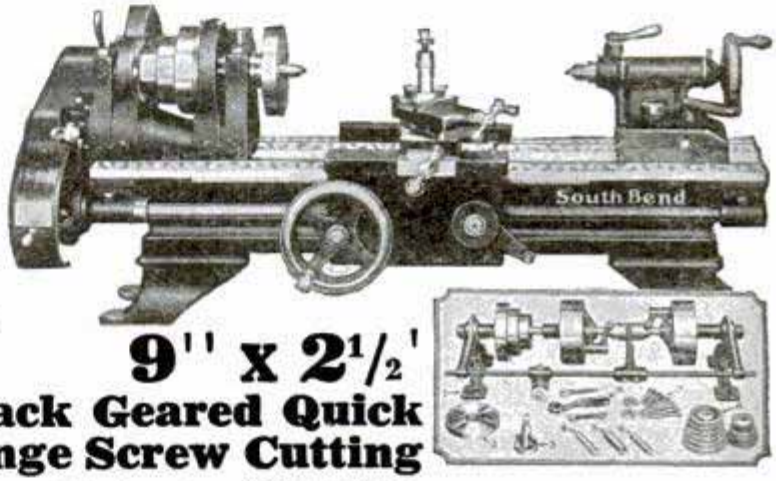
Manufacturing Plant — Machine Shop
Service Station and Electrical Shop

Write for Catalog No. 88 showing complete line of New Model South Bend Lathes ranging from 9 in. to 24 in. swing and from 2½ to 16 ft. beds—with countershaft or choice of 3 types of electric drives, all at surprisingly low prices.

Precision 64 accuracy tests with precision instruments applied in the manufacture of each South Bend Lathe insure its accuracy.

Speed Simplest adjustment and absence of all unnecessary parts enable the operator to work at highest efficiency.

Durability South Bend Lathes are sturdily built of most durable materials.



Weight 375 Pounds

9" x 2½' Back Geared Quick Change Screw Cutting

Complete with Countershaft and Equipment **$150**

Built in the same plant where 38,000 other fine Precision Lathes have been manufactured for the United States Government, Ford, Westinghouse, Bethlehem Steel Co., U. S. Steel Corporation, and hundreds of other large industries in the United States and 64 Foreign Countries. It is the world's largest Lathe value.

Features

- —Power Feed to Carriage
- —Set-over for Taper Turning
- —Hole through spindle ¾ in.
- —Precision Lead Screw
- —Cuts threads 4 to 40 per in.
- —Maximum draw-in Collet size ½ in.

Easy Payments if Desired

A small down payment brings you the Lathe to use while you are paying for it. In this way it earns its own cost by the work it does and the savings it makes.

FREE—Write for No. 88 Catalog and New Booklets

Check off in the squares below, indicating the lathes in which you are interested. Tear this sheet out of the book and mail to us. Special booklets and Catalog No. 88 mailed free postpaid on request.

- ☐ 9 in. Junior Booklet 22k
- ☐ 9 in. Lathe Booklet
- ☐ 11 in. Lathe Booklet
- ☐ 13 in. Lathe Booklet
- ☐ 15 in. Lathe Booklet
- ☐ 16 in. Lathe Booklet
- ☐ 18 in. Lathe Booklet
- ☐ General Catalog No. 88
- ☐ "How to Run a Lathe" price 25c, postpaid

South Bend Lathe Works : 636 E. Madison Street, South Bend, Indiana, U. S. A.

New York City Salesroom: 183 Centre Street

SOUTH BEND LATHES

No. 153
A popular priced, pistol grip frame.

No. 169
Easy grip frame, exceptionally rigid and with a wonderful 'hang.'

Choose them as carefully as your tools—

Starrett Hacksaw Blades and Frames have the same enduring quality of materials and workmanship that have made Starrett Tools the choice of tool users the world over.

There is a Starrett Hacksaw for every job. Use the famous Starrett Hacksaw Chart to select the one best blade for the work. We'll gladly supply you with a free copy.

A Starrett Blade in a Starrett Frame gives you the ideal combination for clean, quick cuts at *lowest cost per cut.* It pays to insist on Starrett's. Your tool dealer carries them.

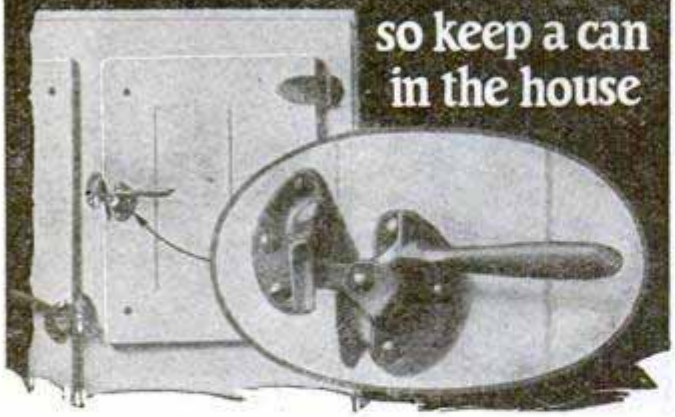
Write for Starrett Hacksaw Chart and Catalog No. 24 "AP" describing and illustrating all types of blades and frames as well as 2500 fine tools.

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

Use Starrett Hacksaws

1650

You never know when or where you may need SMOOTH-ON NO. 1 so keep a can in the house



A 50-lb. block of ice dropped on this icebox handle, bent the lever, stripped the screws and splintered the wood. Larger screws could not be used and the lock could not be shifted. A new door seemed necessary. Instead the owner fitted the splinters back, filled the screw holes with about 5 cents worth of Smooth-On No. 1, and put back the screws. When the Smooth-On metallized, the lock became strong as new. The repair will last as long as the icebox.

Any handy man can make equally practical home and automobile repairs with Smooth-On No. 1 and avoid a repair bill every time. Use it to stop leaks in steam, water, gas, oil or stove pipes, mend cracks, breaks or leaks in furnaces and boilers, radiators, tanks, sinks, pots and pails, make loose handles tight on umbrellas, knives, hammers, brushes, drawers, etc., tighten loose screws, hooks, locks, door knobs, etc.

Automobile repairs:—Making bursted water jackets and pumps good as new, stopping leaks in radiator, hose connections, gas tank and gas, oil and exhaust lines, making a fume-proof joint between exhaust pipe and tonneau heater, tightening loose headlight posts, keeping grease cups, hub caps and nuts from loosening and falling off, etc.

To get perfect results, write for and *use* the Smooth-On Repair Book.

Write for FREE BOOK

Get Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins at any hardware store or if necessary direct from us.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 37,
574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name.....

Address.....

4-28.....

Thompson BEATS the World on BOATS

THOMPSON BOATS

CATALOG FREE!

OUTBOARD MOTOR BOATS—A complete line of strictly up-to-date racing models, good for over 30 miles an hour. Also some entirely new models for general pleasure use with a speed of 20 to 26 miles an hour. Built strong and durable and absolutely safe.

Rowboats $44.00 and up—

The most complete line ever offered, at real money-saving prices.

Canoes $48.00 and up—

Some all wood, others canvas covered. Light, swift, safe, strong and durable. Choice of many distinctive color combinations.

Motor Boats—

With or without Engine. For Lakes, Rivers, Shallow water and weeds.

CATALOG FREE — SAVE MONEY — ORDER BY MAIL

Please state the kind of boat you are interested in (30)

→ TWO LARGE FACTORIES ←

THOMPSON BROS. BOAT MFG. CO.

213 Ann St. PESHTIGO WISCONSIN (*Write to Either Place*) 113 Elm St. CORTLAND NEW YORK

MOTORCYCLES

Price $10 and up purchased through our Co-Operative Plan for as low as $1.00 down and $1.00 per week

Indians Harley-Davidsons Ace Henderson and Clevelands

Send ten cents for Bulletin A.

Motorcycles shipped to all parts of the world

WALKER-INDIAN CO., 78 Brookline Ave., BOSTON

MOVIES AT HOME

Many models of genuine MOVIE MACHINES, some as low as $3.75, all using standard size big theatre films. Our stock of films is the most complete and lowest in price—with an exchange service. Films of leading stars and religious subjects are available. DON'T DELAY. WRITE FOR FREE INTERESTING CATALOGUE NOW!

PARAMOUNT MFG. CO.

Dept. 1371 BOSTON, MASS.

This Wonderful Invention Will Net You $20.00 a Day.

Here's a world-beater for making money. A simple, yet wonderful invention that instantly improves the riding qualities of *any* car, regardless of make or age. Work 4 or 5 hours a day and I'll show you how RIDE AIR SPRING CUSHION SHOCK ABSORBERS will net you $20.00 *every day!* I NEED 500 MORE MEN—fellows like *you* who want to make money. Your profit is 233⅓% or more on each sale. I can't give you full details here, but listen—the "Ride Air" cushion is a shock absorbing "air bottle" that goes between the long leaves of automobile springs, removes all jolts and jars, and can be installed by anyone. *Takes the place of all snubbers and shock absorbers.* We furnish all equipment FREE. No holes to bore. No bolts to tighten. No selling experience necessary. Just demonstrate "Ride Airs" to every motorist you meet and the sale is made. Write or wire me at once for full particulars and FREE SAMPLE.

Sample FREE

C. F. Hamilton, Desk P. M. 3, No. 530 West 27th St., Los Angeles, Calif.

INVEST 2¢

. . . you may save $200!

Write us *now* for your copy of *this free book*

The fund of facts in "How to Judge a Used Car" may easily save you $200 or more in buying a used car! Boiled down into ten minutes' interesting reading are the safeguards experienced *automobile dealers* apply when *buying* used cars for resale. Every paragraph is the summary of years of experience—every page is full of time-saving, money-making pointers.

Pictures and text in this helpful used car manual give startling information never before made public. They show *you* what code prices mean, why dealers turn the speedometer back to zero, how to fix the value of a used car offered by a friend, how to avoid "orphans"—and other important points the average buyer might overlook.

Send the coupon *now* for your copy. Learn how to get more for your motoring money. Invest 2c in a postage stamp—you may save $200!

Sign and mail the Coupon NOW!

Pledge to the Public on Used Car Sales

1 Every used car is conspicuously marked with its price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.

2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.

3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

1927. The Studebaker Corporation of America.

THE STUDEBAKER CORPORATION OF AMERICA
Department D-72, South Bend, Ind.

Please send my copy of your valuable free booklet, "How to Judge a Used Car."

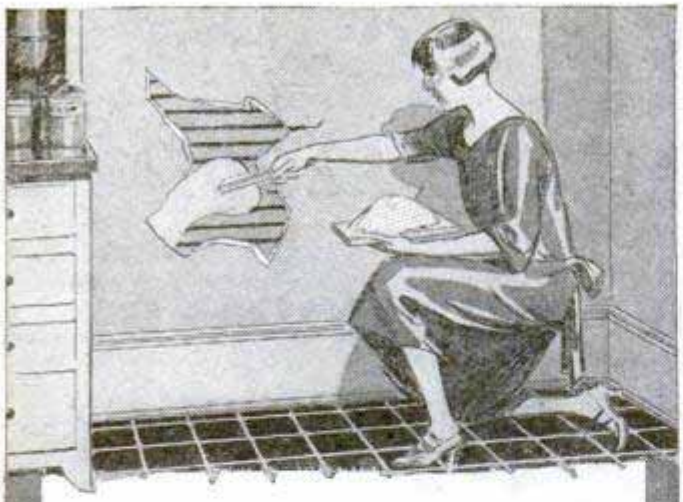
Name .....

Street .....

Town ..... *State* .....

STUDEBAKER

The Great Independent



Cracked Walls
made good as new

JUST mix Rutland Patching Plaster with a little water. Then fill the crack or hole. Your wall is as good as new!

Rutland Patching Plaster makes a *perfect* patch that's as lasting as the wall itself. It will not crack, crumble, shrink or fall out. And it's so easy to apply—no muss or bother. Anyone can use it.

Paint, wall paper and hardware stores sell Rutland Patching Plaster. If your dealer hasn't it, we will mail a package direct and you can pay the postman 30c plus postage. Rutland Fire Clay Co., Dept. V-6, Rutland, Vermont. *Also makers of Rutland Roof Coating.*

We start you in business
and help you succeed

New plan. No experience or capital needed. We furnish everything. Spare or full time. You can easily make

$50-$100 weekly — Write at once

Madison Shirt Mnfrs, 564 Broadway, New York

There where the big fish strike

YOUR favorite fly flicks for a second on the quiet water. . . . Twice, three times you cast. . . . Then whirr! . . . You've hooked a big one. Quickly and easily your partner brings the "Old Town" around and holds it in position for the battle.

"Old Towns" respond instantly to every dip of the blade. Sturdy in construction and light in weight too. When you go out where the big ones strike, be sure that you go in an "Old Town." Prices as low as $67. From dealer or factory.

New catalog gives prices and complete information about sailing canoes, square-stern canoes, dinghies, etc. Also fast, seaworthy boats for *Outboard Motors.* Write for free copy today. OLD TOWN CANOE CO., 1864 Middle Street, Old Town, Maine.

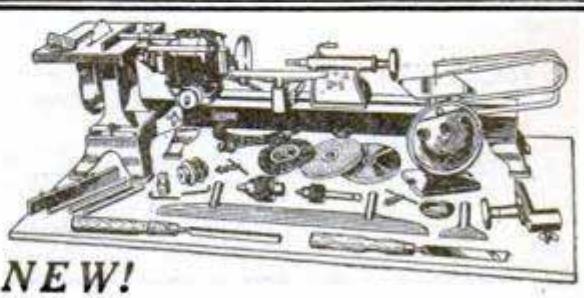
"Old Town Canoes"

I Pay Men $40 A DAY!

S.W. Allen of California made $40.80 in one day's "joyful work"! Hundreds of other men are reporting amazing incomes—many of them doubling and tripling their former salaries.

Just Wear This FREE Cap

Just wear this beautiful hand tailored FREE RAIN-PROOF Cap. When your friends see it, nine out of ten will want one like it. They can't resist the *Rain Proof* idea—it's so new and unique. You can make a splendid income in full or spare time. No experience is needed. "I haven't found a man who doesn't fall for the made-to-measure idea," writes Chas. Horstman. Send at once for FREE Selling Outfit. Taylor Cap Mfgrs., Dept. H-9, Cincinnati, O.

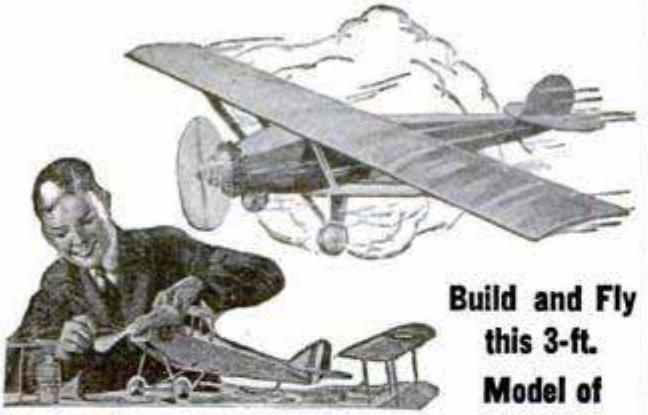


NEW!

H & A UNIT PLAN CRAFTSHOP

Now you can buy a complete, practical, home work shop on the unit plan—get just the items you want or can afford now, and add others as you need them. Consists of the famous H & A Wood Lathe, plus Tilting Table Rip Saw, Scroll Saw, and complete assortment of accessory tools. Double spindle ¼ H. P. motor furnishes power for the whole outfit. 1/3 H. P. motor if desired. JUST PLUG INTO THE NEAREST LIGHT SOCKET. Write for complete description and prices. All items priced separately so you can make up your own assortment.

HESTON & ANDERSON, 604 Western Ave., FAIRFIELD, IOWA



Build and Fly this 3-ft. Model of

LINDBERGH'S

"SPIRIT OF ST. LOUIS"

This IDEAL New York-Paris Monoplane is a perfect copy, 3-ft. size, of the machine in which Lindbergh crossed the Atlantic Ocean. Any bright boy can build this model: The IDEAL Construction Outfit contains everything needed: all parts, fittings, materials and supplies, including careful instructions, plans and diagrams. The model is wonderful; has many features of the original and is guaranteed to fly. **$7.50**

Complete Construction Outfit.....

[West of Denver, Colo., and in Canada, price is $8.00]

Ask your dealer or order direct.

Plans for Model Airplanes 25c per set

New York-Paris Plane, FOKKER North Pole Plane, CURTISS JN4D-2 Biplane, DeHAVILLAND Biplane, N C-4 Naval Seaplane, Bleriot, Taube or Nieuport Monoplanes, Cecil Peoli Racer.

New 64-Page Book of Model Airplanes

Teaches the principles of flying; contains plans and directions for building gliders and racers, and full information about scale Models of real planes; also most complete catalog of materials for model builders. Sent postpaid for..... **5c**

IDEAL AEROPLANE & SUPPLY CO., Inc.
26 West 19th Street New York City

SAVE 30 TO 80% ON AUTO PARTS

Write us for prices on your requirements. Everything for the car at prices only Warshawsky can offer!

WARSHAWSKY & CO. 1915-35 S. State St. Dept. PM4, Chicago

World's Largest Replacement Parts House

"Paint Spraying Brings Quick, Easy Profits"

H B does the work of five brush painters. One man can do the work of five painters with brushes with an H B Portable Paint Spray. Does automobile painting, furniture refinishing, house painting, inside and out, at prices no one can touch, with big profits for yourself. **Pays for itself** — Only $20 monthly. Easy payment terms brings it to you with practically no investment. **Thirty Days' Trial.** Write for valuable bulletins.

Hobart Bros. Co., Box M482, Troy, Ohio

Photos ENLARGED

Size 16x20 inches

Same price for full figure or bust, groups, landscapes, or pet animals, etc., enlargements of any *part* of group picture. Safe return of your own original photo guaranteed. **98c**

SEND NO MONEY Just mail photo or snapshot (any size) and within a week you will receive your beautiful life-like enlargement size 16x20 in. guaranteed fadeless. Pay postman 98c plus postage or send $1.00 with order and we pay postage. **SPECIAL FREE OFFER** With each enlargement we will send FREE a hand-tinted miniature reproduction of photo sent. Take advantage *now* of this amazing offer — send your photo today.

UNITED PORTRAIT COMPANY
1652 Ogden Ave. Dept. 364 Chicago, Ill.

Agents! Stand on this Marvelous Pen and Make $52.00 a Day

Storr of Missouri writes that $52 a day is easy. He says his customers marvel when they find they can see through the Reservoir Pen and it doesn't break when he stands on it. Hundreds of others write telling the same story. The Reservoir Pen holds three times as much ink as other pens, yet it is no larger in size. Has **solid gold point** with finest iridium tip. Comes in assorted colors. You will find, that with our sales plan you easily take orders for twenty-five to fifty a day.

Customers Everywhere—Everyone Writes

Doctors, lawyers, clerks, housewives, ministers, storekeepers, school children—in fact everyone a prospect. Show the handsome Reservoir Pen, demonstrate its features, show the **patented self-filler** which permits it to hold three times as much ink as other pens. Get order and your **cash commission** on the spot.

Sells for $3.00—Pays You $1.00 Profit

Guaranteed to be equal in appearance and quality to any $7 pen. Our price is only $3.00. **You do not carry stock.** Just take orders and collect $1.00 advance commission when sale is made.

Get Our Free Plan—Send No Money

Convincing evidence will be sent to you on request proving beyond doubt that you can make from $25 to $52 a day. **Write today** and learn how—there is no obligation. (If you want to see this wonderful pen and start taking orders at once, enclose $2.00 for a demonstrating sample.)

BONDED RESERVOIR PEN CO.
Dept. 1004 147 Nassau Street, NEW YORK

Making Big Money Is Easy

Floor surfacing and floor maintenance is an ever increasing business. With only a small investment, you can get the finest electrically driven machines for performing this work and establish yourself in a business of your own. No one ever got any place working for the other fellow. It's the man "on his own" that gets ahead.

This business is good the year 'round but RIGHT NOW it's at its height! If you want an income of $50.00 a day, sign and return the coupon at once!

The American Floor Surfacing Machine Co.,
523 So. St. Clair St., Toledo, Ohio.

Without obligation please send me full information about

- ☐ American Universal floor surfacing business.
- ☐ American Electric floor maintenance business.

Name.....

Address.....

City.....State.....

JAPANESE ROSE BUSHES

10 Cts.

The Wonder of the World

Japanese Rose Bushes **bloom all the year round.** Just think of it. Six weeks after planting the seed, the plants will be in **full bloom.** It may not seem possible, but we positively **guarantee it to be so.** They will **bloom every ten weeks,** Summer or Winter, and when three years old the bush will be a **mass of roses,** bearing from five hundred to a thousand roses on each bush. The flowers are in three shades —white, pink, and crimson. The plants will do well both in and out doors. We guarantee at least three bushes to grow from each packet of seed. **Price, 10c** packet, 3 pkts. for **25c** postpaid.

Chinese Fragrant Tree Fern

Just introduced; noted for its rapid growth. An exceptionally pretty ornamental plant. Foliage is rich dark green. Forms grand pyramidal bushes about 5 feet high. Branches very desirable for decorative purposes, wreaths, etc. **Seeds 15c pkt., 3 for 40c.**

Weather Plant

NATURE'S WEATHER PROPHET

By mysterious changes that take place, this remarkable plant accurately forecasts the weather many hours in advance. Will grow anywhere all the year around. An interesting house plant. Bears large, fragrant, pink, butterfly shape flowers. **Seeds, 15c packet, 3 for 40c, postpaid**

GROUND ALMONDS

Amazingly Prolific—Easily Grown From Seed

The Ground Almond has a flavor that is MOST EXCELLENT, resembling the cocoanut. The meat is snow white, covered with a shell or skin of brown color. It grows close to the surface and anything from 200 to 300 Almonds may be expected from a single nut. There is no trouble whatever in growing anywhere and in any kind of soil. May be planted any time, and in eight or ten weeks from time of planting you will have an ENORMOUS CROP of the MOST DELICIOUS ALMONDS YOU EVER TASTED. **Seeds 15c Pkt.**

Perfume Plant

Blooms only at night, giving forth the most delightful scented fragrance for quite a distance. Causes much comment. For house or garden. Also valuable because of rare perfume made from it. **SEEDS, 10c pkt., 3 for 25c.**

SENSITIVE PLANT

Marvel of the Philippines. Leaves curl, fronds droop when touched. Apparently resents interference. A handsome shrub for house or garden; very curious and interesting. **Seeds, 15c pkt., 3 for 40c.**

Calabash or Pipe Gourds

A luxuriant and rapid growing climber; thrives anywhere. Produces the ornamental gourds from which the famous African calabash pipes are made. Grow this interesting vine and make your own. **Seeds,** with instructions, **15c pkt., 3 for 40c.**

Japanese Nest Egg Gourd

Very curious. Produces fruit same size, shape and color of nest eggs. Matured fruit does not crack. Will serve for years as a nest egg, stocking darner, ornamental purposes, etc. **Seeds 15c pkt., 3 pkts. for 40c. J.S.&CO.**

Mammoth Peanuts

Peanuts can be easily cultivated. Their culture is very simple and exceedingly interesting. Mammoth Peanuts grow to an astonishing size. It is a good producer, very prolific, and the **giant nuts** have a thick, heavily ribbed protecting shell. The plant is very attractive, the leaves being of odd shape and a handsome green shade, tinted through the center with white. You will derive much pleasure cultivating this interesting species. **Seeds 15c pkt., 3 pkts. for 40c.**

Musk Plant

A universally admired favorite for house, flower garden or greenhouse. A very fine house plant. Lives for years. Is of the sweet scented variety, giving forth much fragrance. Also valuable on account of the perfume that can be made from it. **Seeds 15c pkt., 3 for 40c.**

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Unusually strong and vigorous growing vine. Attains twice the size of ordinary varieties. Grows readily on fences, poles, trellises, etc. One hill will keep an entire family supplied all summer. **Seeds 15c packt. 3 for 40c, postpaid.**

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A vineless Musk Melon, grows in bushes, and thus can be cultiveted in the smallest garden. The fruit is of the popular "Jenny Lind" type, but larger, averaging 5 inches in diameter. The flesh is very deep, edible almost to the rind and is colored light green, flushed with salmon toward the center. The quality is superb, lusciously sweet and juicy. **Packet of seeds,** with full directions for culture, **15 cents, 3 packets for 40 cents, p.pd.**

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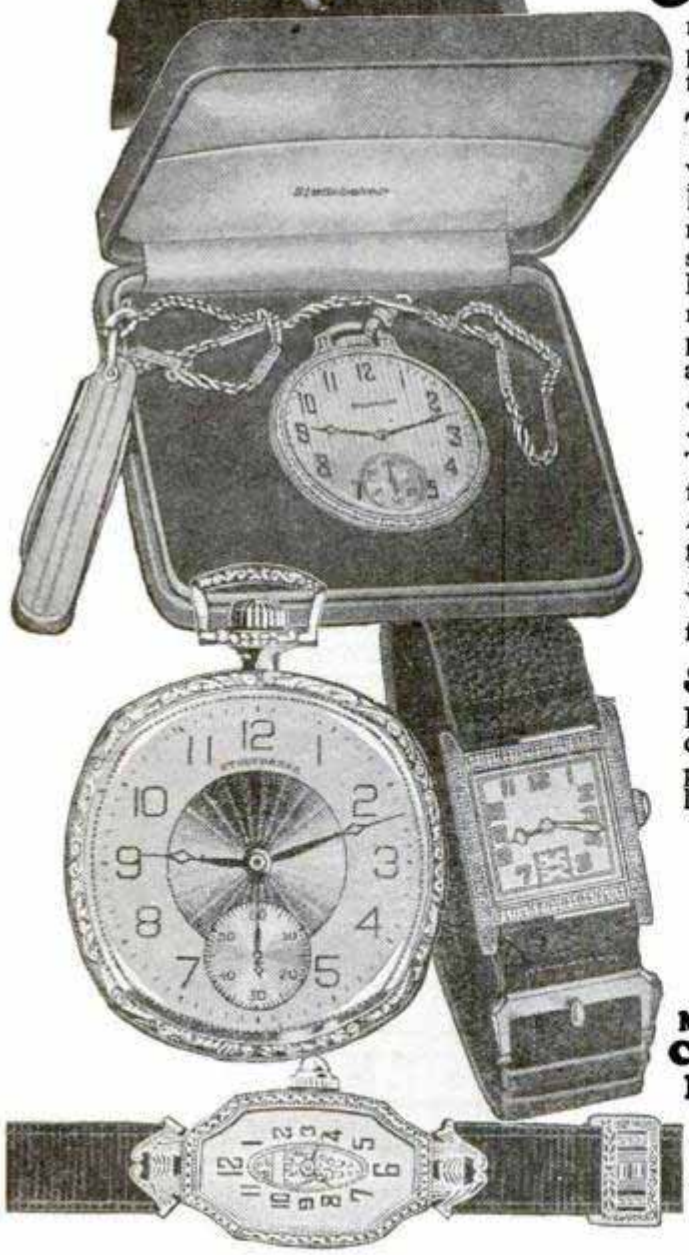

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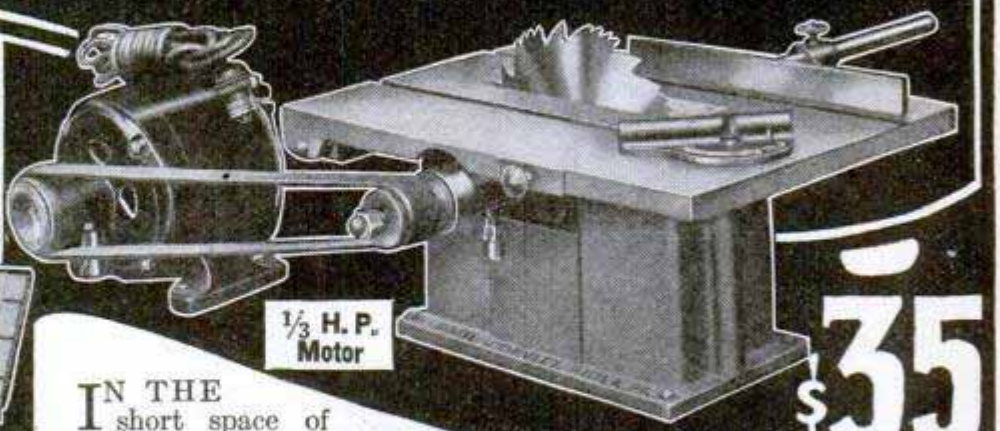
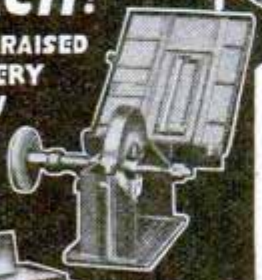


SAW TABLE RAISED SHOWING EMERY WHEEL, SAW GUARD AND DRILL ATTACHMENT



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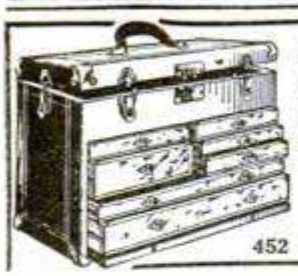

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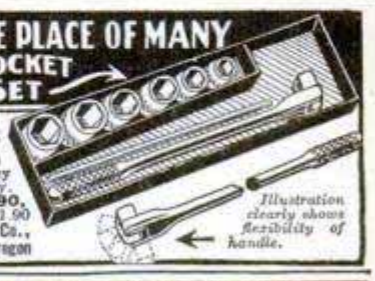

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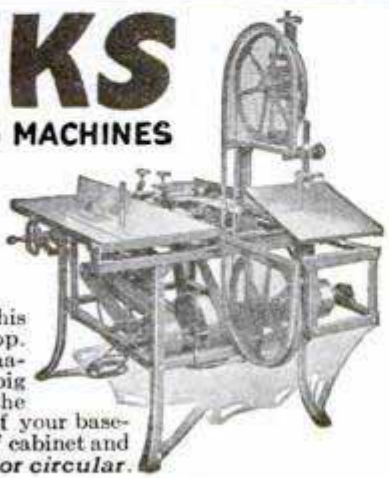

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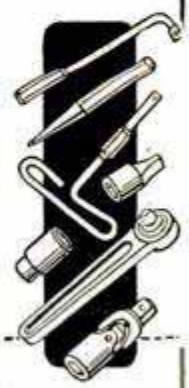

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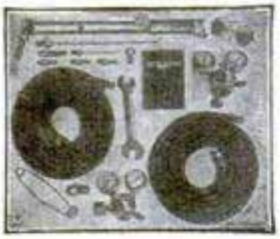

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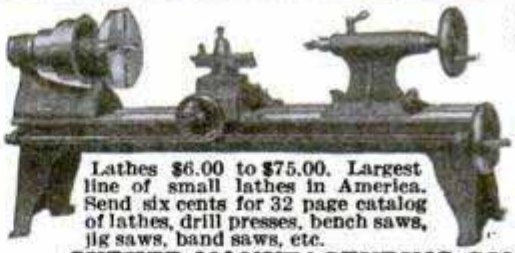

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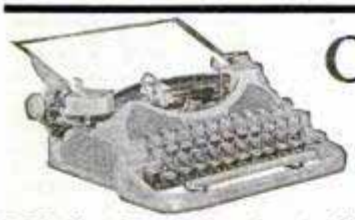

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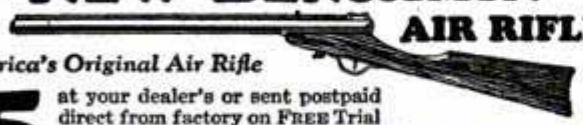

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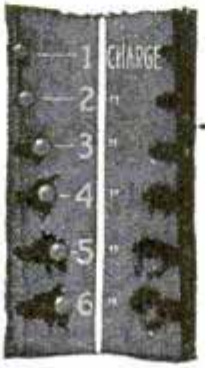

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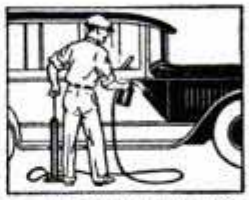

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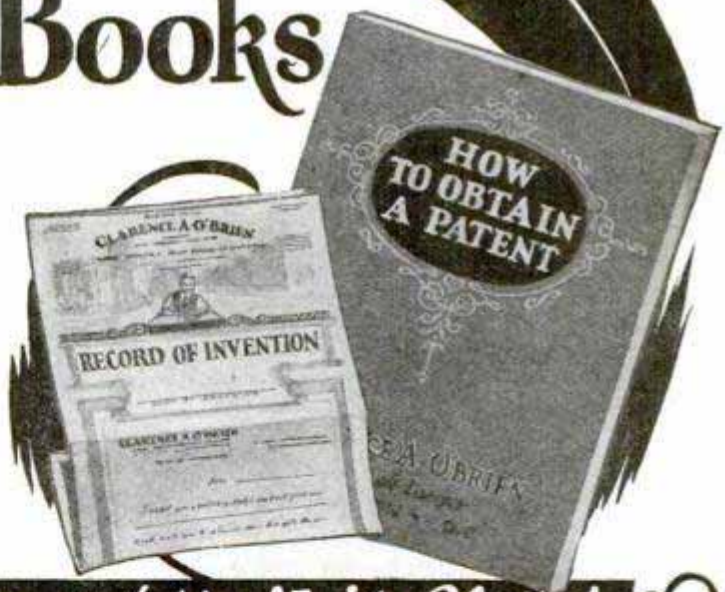

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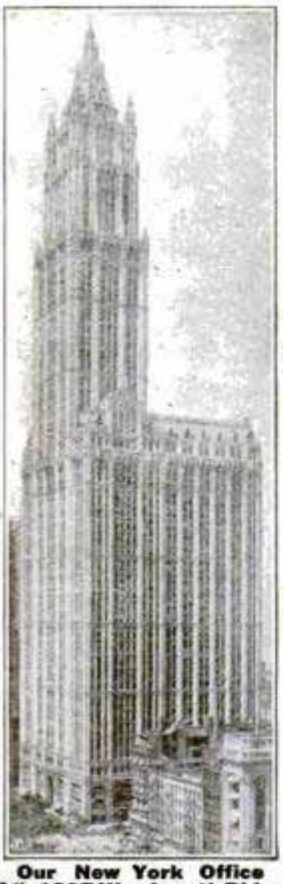

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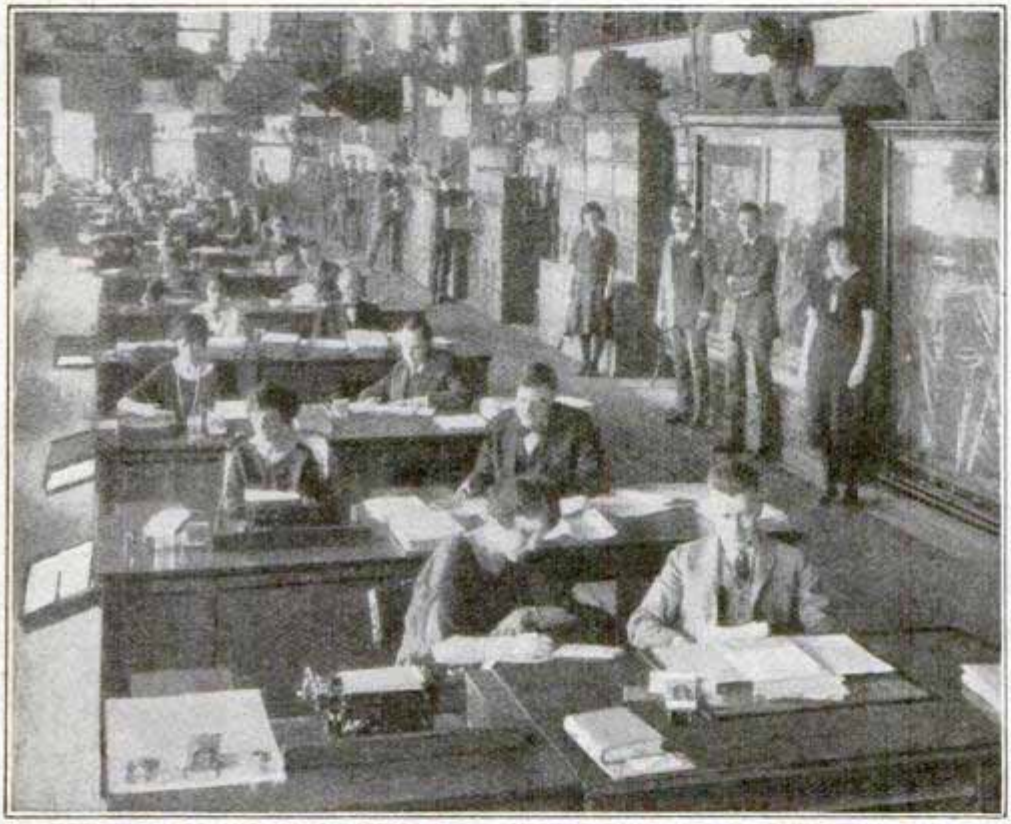

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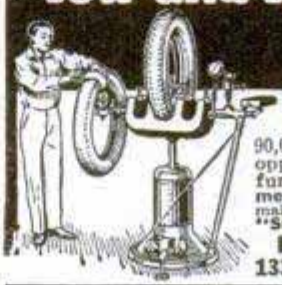

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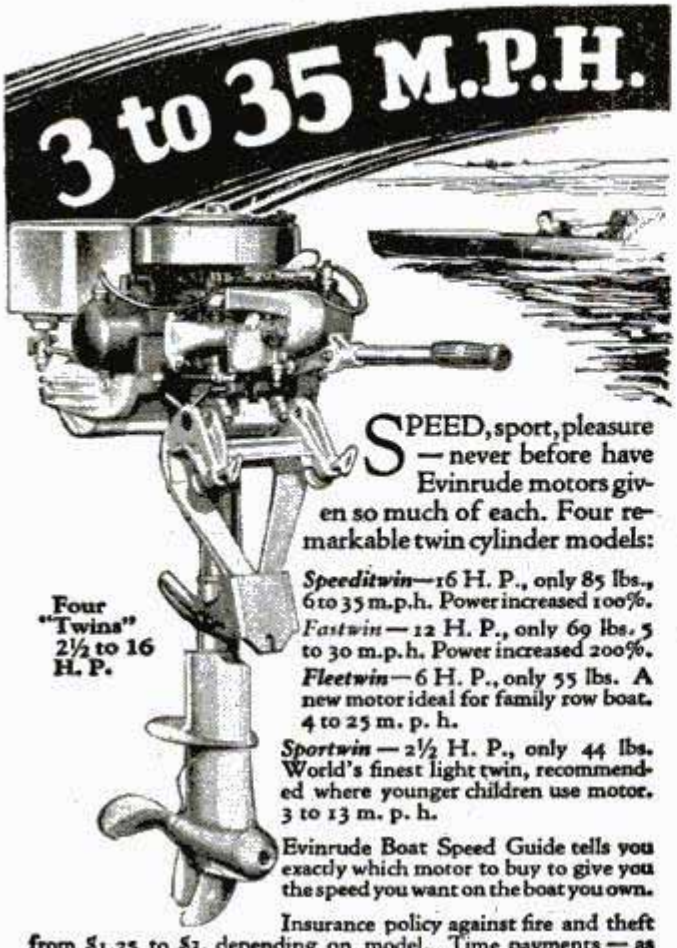

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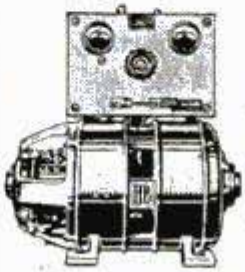

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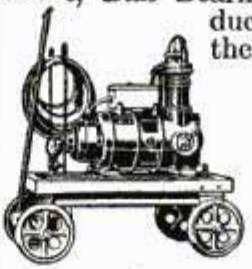

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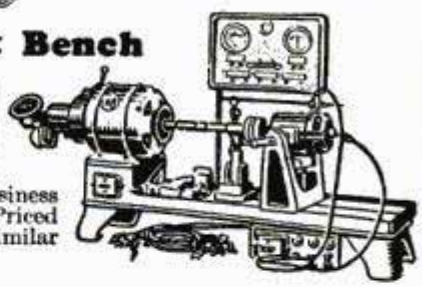

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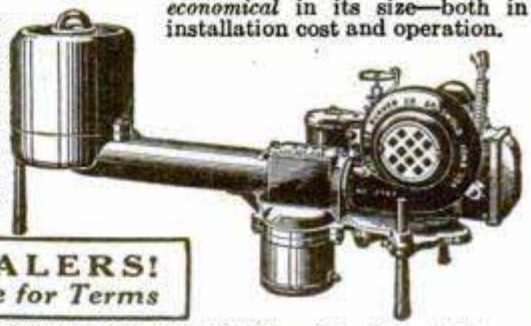

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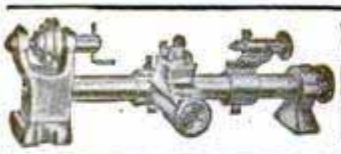

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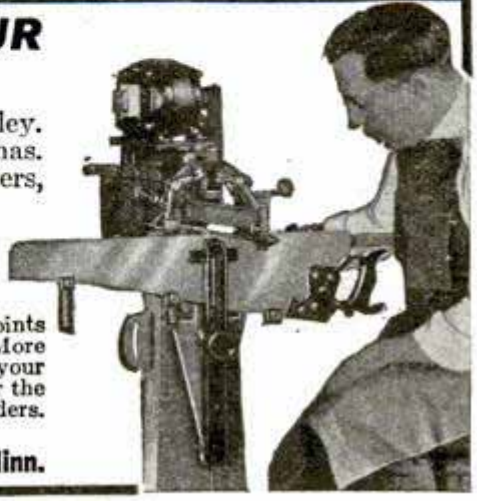

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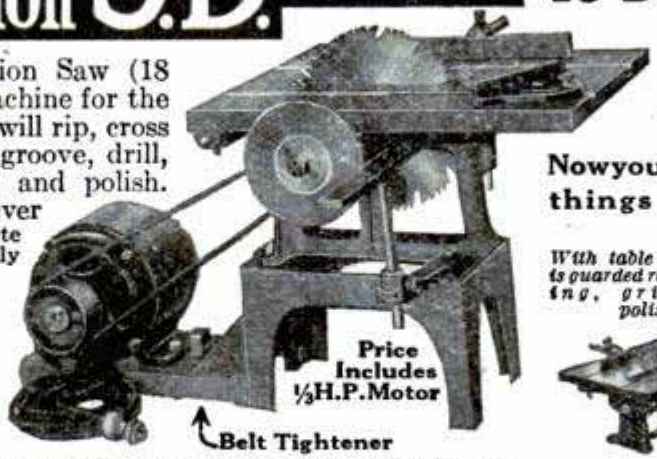

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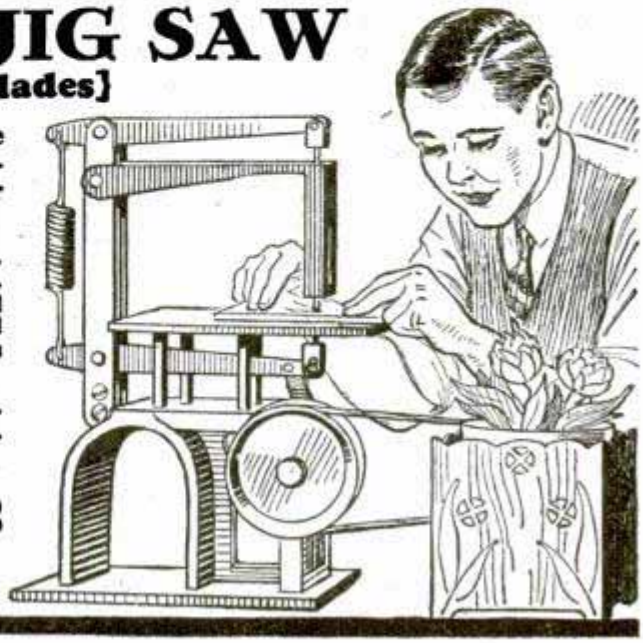

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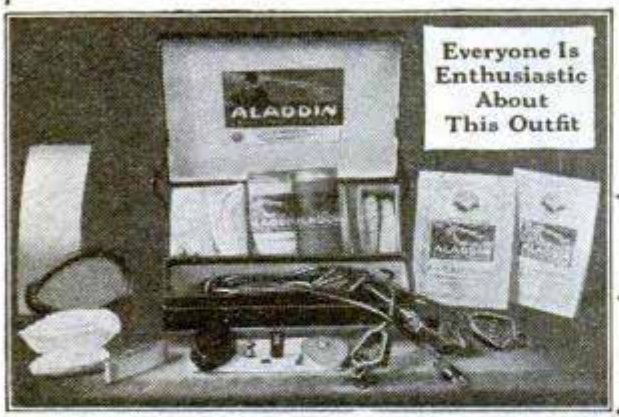

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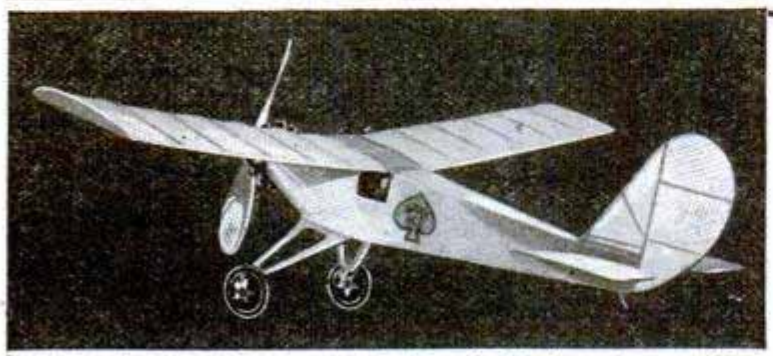
ASTRA-CLOCK COMPANY
Box 27, 660 Barry Avenue, Chicago, Illinois



Weight, less than four ounces—Wing Spread, 30 inches—Demountable motor and wings—Balsa wood sides and ribs—Flexible propeller and landing gear—Celluloid wheels Shock absorbers—Winding Device for rubber.
Complete parts and instructions for assembly in half a day's time

Model Supplies of All Kinds

The "SILVER ACE" FLYING MODEL

FLIES 800 FEET

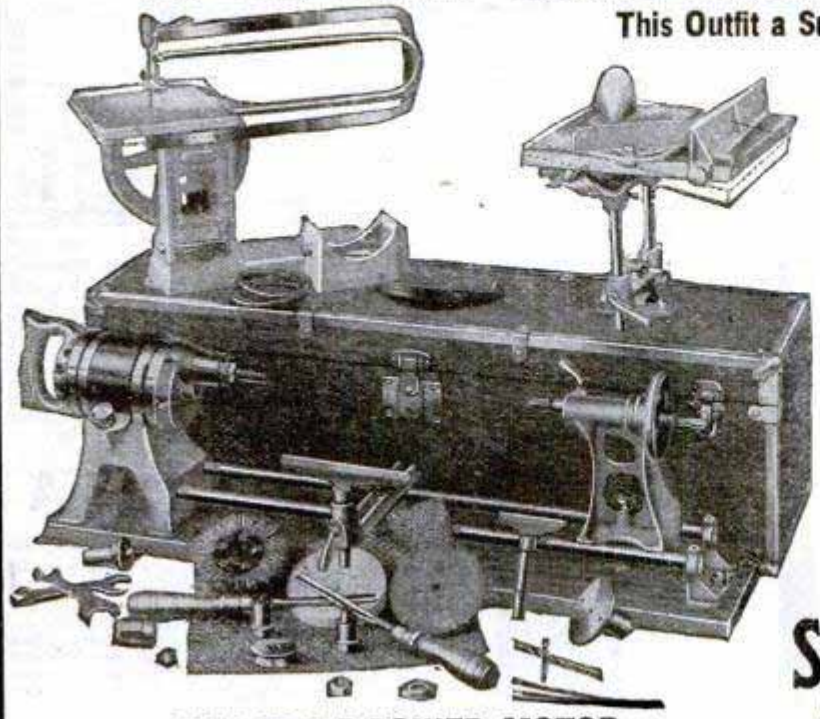
De Luxe Model covered with waterproof silk (Ready to Fly) $12.50
Standard Model (Ready to Fly) 10.00
Partly Assembled 8.00
Knocked Down 7.00

50 Cents Extra for Packing and Shipping

THE AERO MODEL CO. Dept. P, 421 S. Clark St. CHICAGO

HOME MECHANICS MADE EASY WITH THE NEW "UP-TO-DATE HOME-CRAFTSMAN SHOP"

This Outfit a Superior Development Over All Others



The Up-to-Date Home Craftsman Shop can be used in any home lighting fixture, making of your old fashioned work bench a complete machine shop. Complete it is made up of a Super-Power Motor, a precision lathe (10" x 34"), featuring the bevel, a miter, side and depth gauges, a tilting table, jig-saw, and all accessories for buffing, grinding, cleaning and all portable or stationary drilling and sawing. This equipment will make you an advanced craftsman. Master mechanics have designed and skilled engineers have constructed this equipment which, after inspection, you will agree is the best of its kind. For those who build, invent, create and construct at home it is unexcelled.

OUR EDUCATIONAL AND BLUE PRINT DEPARTMENTS

Under personal supervision of Master Craftsman Eugene E. Maurey, offers special correspondence crafts course, giving in simple detail full information on home handicraft. Blue print service giving plans and details for making hundreds of pieces of wood handicraft included in this course FREE to our users.

GUARANTEE

After receipt of the Up-to-Date Home-Craftsman's Shop, if you are not satisfied, without question or delay every cent refunded and return express charges paid.

THE SUPER-POWER MOTOR

The drive power of our shop equipment is positively the latest development in electric drill motors. It produces ½ H.P. operating on 110, 220, or 32 volt currents either A.C. or D.C. and is guaranteed not to burn out or wear out in the ordinary use of home or factory. It drives the lathe, circular saw, jig saw, a 15" band saw, a 4" jointer with amazing power and durability. For further details on this Super-Power Motor and the perfected shop it operates, mail the coupon at right **TODAY.**

SENT ON TRIAL

MAIL THIS

for full particulars to
Up-to-Date Machine Works
2915 S. Wabash Ave., Chicago, Ill.

MANAGER, Dept. 6. Without any obligation, please send me full particulars about your shop, 10-day free trial, free blue prints, free crafts course, also, $10.00 down payment offer.

NAME .....

ADDRESS .....

Model Ship Builders
"FLYING CLOUD"

Popular Mechanics readers who have watched with interest the building by James Tate of a model of the Flying Cloud, but have been rather timid about building one of their own, are informed that we have an approved construction set containing all necessary materials with the heavy work already done eliminating much work and saving the model maker the time and trouble of gathering the various requirements. For those having a model "under way," we can supply in the finished form such materials as anchors, chains, bitts, chocks, capstan, steering wheel, blocks, deadeyes, finest grade rigging lines, etc. Our large, illustrated catalog containing photo reproduction of various models, together with prices and illustrations of the above, sent postpaid upon receipt of 10 cents (coin preferred.) Construction sets and parts for making other scale models are included.

MODEL SHIP SUPPLY CO., Dept. B, Mineola, N.Y.

Step Into Your Own Business

$5000 to 6000 a Year

PUFFLES New! Delicious!

STOPS THE CROWDS!

It's the mystery Puffles Machine that does the trick. Attracts INSTANT attention. Transforms the dry flavor-assorted flakes like magic into big, crisp, vari-colored Puffles. Crowds gather. They can't resist. They buy fast at 10c a sack—and become steady customers.

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Everybody likes Puffles. They're so different. Just a taste and you'll know why this "goody" was the sensation of the Chicago Food Show. Puffles process secret. Sales profit enormous. One dollar's worth of Puffles—$4.00 clear prv.fit. No waste!

FREE OFFER! We make it easily possible for you to step into this new, fascinating, profitable Puffles business. With your Puffles Machine we include 50 pounds of Puffles **FREE** which, when sold, returns your small investment, plus a nice profit. Write us—NOW—TODAY.

PUFFLES, Inc.
3027 S. Wabash Ave., Dept. 504, CHICAGO

MECHANICS everywhere praise these tools of amazing strength and unequalled quality. For 7 years they have been accomplishing work which no other tools can possibly equal. In hard use—and even abuse—they hold up, meeting every test.

Made from Special Formula Steel

Every RAINEY Tool is **hand made of special formula steel.** Forged, heat-treated, hardened and individually tempered in oil. Chisels, Punches, Wrenches, Pliers, Rivet Busters, Bearing Scrapers, etc.—designed by real mechanics for the hardest kind of use.

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These are tools **backed by a positive guarantee.** Mail the coupon at once for complete illustrated catalog. Test any tools you desire at our risk! We will instantly replace them or **send your money back** at once, if not fully satisfied.

Big Opportunity for Salesmen!

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Send me your new illustrated catalog with prices on full line of RAINEY Hand-made Tools.

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An extraordinary offer! Genuine L. C. Smith ball-bearing typewriter at a 50% saving—and for only $4 a month. Here's your chance to own the finest machine made at rental prices. Only a limited number of these superb type writers available at these low prices and easy terms.

Only $4 a Month

You cannot imagine the perfection of this wonderful ball-bearing typewriter until you have used it. Positively the easiest writing, fastest running, longest wearing typewriter made. Test this magnificent machine in your home or office for 10 days. Then you'll know money cannot buy a better, more beautiful, rebuilt typewriter.

Guaranteed 5 Years

For over 20 years the L. C. Smith has been recognized as the best typewriter made. The U. S. Government bought 40,000. It is the choice of big corporations like the Standard Oil Co., etc IT IS THE WORLD'S ONLY BALL-BEARING TYPEWRITER.

Send No Money

Just mail the coupon—we'll send you the typewriter for a 10 day trial. No one will urge you to buy. Unless the typewriter sells itself to you, return it at our expense. But you'll want to keep it, and you can for only $3 down and $4 a month. By using coupon *you receive free $3 worth of extras (Tools, Waterproof Cover, Home Study Touch Typewriting Course, etc.)* Send coupon now before the offer is withdrawn.

$50 SAVED BY USING THIS COUPON

SMITH TYPEWRITER SALES CORP.
114-360 E. Grand Avenue, Chicago, Ill.

Ship me genuine L. C. Smith, F.O.B. Chicago. On arrival I'll deposit $3 with express agent. If I keep machine, I'll send you $4 a month until the $45.50 balance of special $48.50 price is paid; the title to remain in you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent, who will return my $3. You are to give your standard 5-year guarantee. (Special price for cash, $45.45.)

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*City*_____ *State*_____

*Occupation*_____

*Employed by*_____

Let us recommend the best books to study on any subject. Popular Mechanics Press, Chicago, Illinois.

Amazing New Ground Antenna

Get Far Away Stations Loud and Clear Regardless of Static Conditions

Radio Engineers and hundreds of users report that Aer-O-Liminator, the sensational new **Ground Antenna**, gets better long distance reception, almost unbelievable freedom from static and outside noises, far greater selectivity and marvelously clear and sweet tone quality.

Curtis of Ill., says "There's no such thing as static trouble since I got my Aer-O-Liminator. I get stations I never got before—so loud and clear I would almost swear they were in the next room." In addition you are free from troublesome overhead aerials that everyone now knows are static-gathers. Aer-O-Liminator (Ground Antenna) is simple and easy to install. Takes but a few minutes.

FREE TRIAL

Make this thrilling test at our risk!

Install an Aer-O-Liminator (Ground Antenna). Leave your old overhead aerial up. Try out on a night when static is bad. If you do not get a wonderful improvement in freedom from static, greater selectivity and clear sweet tone without interfering noises, if you can't get good reception on stations that are drowned by static on your old aerial, you need not pay us a red cent for this test. Write us today for scientific explanation of Aer-O-Liminator (Ground Antenna), proof of performance, and our conclusive iron-bound guarantee and remarkable Free Trial Offer. Write today!

CURTAN MFG. CO.
154 E. Erie St. Dept. 805-E
Chicago, Ill.

AIRPLANE

12-inch scale model of Lindbergh's Spirit of St. Louis. Very realistic. Rises from ground by own power. Flies 30 ft. or more. Easily built without tools. Construction set, with all parts and full directions, postpaid in U. S., only 50c (no stamps). Satisfaction or money back. Send today.

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"Be the Life of the Party"

Play a Tune in 10 Minutes

Anyone can play the **Ukulele, Tenor Banjo, Guitar, Banjo Uke** or **Mandolin** with an amazing new invention. **NO** knowledge of music required. *Play tunes from the start* by numbers instead of notes, or by notes if you wish. Simple as 1-2-3, "Works like a typewriter—" "*just press the keys and play.*" Now so easy to play! Astonish your friends by playing latest "hits" and old favorites. **NO** more costly lessons! **NO** weeks of tiresome practice! So simple a child can use it. Over **50,000 delighted users**—young and old, men and women now playing.

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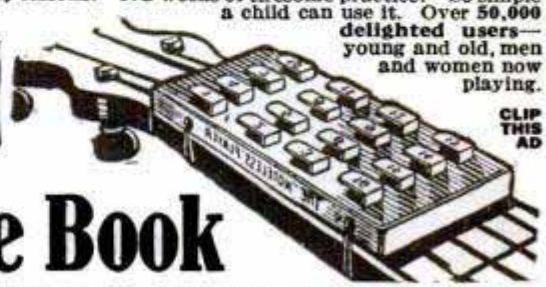

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Send for free book telling the *amazing story* of this *marvelous device.* Contains letters from hundreds now playing who could never play before. E-Z Player can be attached to your own instrument in a jiffy. Or we'll send your choice of instruments with Player attached on *easy payment terms.* Satisfaction guaranteed. **"No play, no pay!"** Have more fun, popularity, money-making chances, more friends—*send today for* **free book.** No obligation.

FERRY & CO., 1750 N. Robey St., Dept. 1775, Chicago, U.S.A.

$351.00 CLEARED IN ONE DAY

So writes W. H. Adams of Ohio. Letter from V. A. Marini of California reports **$11,275** sales in three months. Jacob Gordon of New Jersey **"$4000** profits in two months." Alexander of Pennsylvania **"$3000** profits in four months." Ira Shook **$365** sales in one day. Bram bought one outfit April 5 and 7 more by August 28. Iwata, bought one outfit and 10 more within a year. Mrs. Lane of Pennsylvania says "sold **8000** packages in one day." J. R. Bert says "only thing I ever bought that equaled advertisement." John Culp says: **"Everything Going Lovely.** Crispette wrappers scattered all over town. It's good old world after all." Kellog, **$700** ahead end of second week.

WE START YOU IN BUSINESS

Furnish secret formulas, raw materials, and equipment. Little capital required; no experience needed.

BUILD A BUSINESS OF YOUR OWN

No limit to the sale of Crispettes. Everybody likes them. It's a delicious food confection. Write for facts about a business that will make you independent. Start now in your home town.

Profits $1000 a Month Easily Possible

Send postal for illustrated book of facts. It contains enthusiastic letters from others—shows their places of business, tells how and when to start, and all information needed. Free. Write now!

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428 High Street **Springfield, Ohio**

The International Motor Saw

does every sawing job from straight cutting to intricate scroll and design work; crosscuts, rips, miters, bevels, inside and outside jig sawing and scroll cutting. One saw instead of several.

Write for full description. **Dept. S, The International Stamping Co., 400 N. Leavitt St., Chicago, Ill.**

Drawing Account and Traveling Expenses to Distributors

of Econo-Gas, new fuelizer and decarbonizer that users report gives up to 80 miles on 2 gals. of gas. Fits all cars. Agents wanted who can make $300.00 to $800.00 a month. Sample offer Free to Agents. Write,

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Player Agents Wanted

to represent us in your community, taking orders for the famous Buescher Saxophone and other musical instruments. The Buescher Saxophone is the easiest of all instruments to learn to play. Has many exclusive features; used by the greatest professionals. Easy terms of payment make them easy to sell. Every one is a prospect—young or old. Experience not necessary. We supply advertising material and help you get started. All or part time. Liberal commission. Write for information. (451)

Buescher Band Instrument Company
2508 Buescher Block
Elkhart **Indiana**

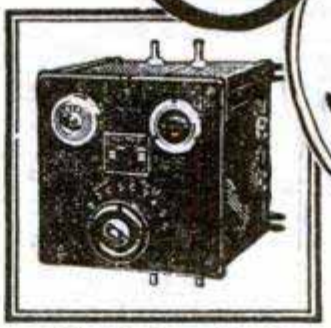
Step Into Your Own Business

$75 to $125 Weekly
Charging Batteries

The battery business is a good sound, profitable business. It is increasing every year. The wise man who is looking for a good income and a big future should look carefully into what I have to offer.

I'm talking from a wealth of successful experience in putting men into a big paying business. Men from all walks of life are making a success with my personal service and co-operation.
Let me show you how to make big money right from the start.

only $5.00 is required to start. Easy monthly payments are only a small part of your big monthly earnings.



The Holmes is the most successful Service Station Charger ever constructed. It is years ahead of ordinary chargers. You can charge from 50% to 75% more batteries with the HOLMES and at a saving of 40% to 60% in electric current. Letters in my office from thousands of users say that it is easy to get all the business with this Service Station Charger.

No Experience Required

I explain all details, start you in a business of your own, give you the secrets of getting the business, give you free consulting service and put you on the road to big profits. I do not sell Chargers to men who will open up competing stations—once you have installed your Holmes Service Station charger the business you work up is permanently yours.

New territories are now being opened. Don't delay. Complete details are explained in my FREE Book "Big Profits." Get your copy at once. USE COUPON.

C. F. HOLMES, Chief Engineer, Dept. 30, Independent Electric Works, 5116 Ravenswood Avenue, Chicago.

Please send FREE BOOK and complete details.

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FREE BOOK-Just Out

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES. Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, price 25c. Larger sizes, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 821 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. 25c, 3 for 65c postpaid anywhere.

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design, two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. Only 25c ppd.

Exploding Cigarettes

JUST LIKE ORDINARY CIGARETTES, BUT SUCH REAL STARTLERS! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box.

NOVELTY BADGES

Kissing Permit 10c *Garter Inspector 10c*

Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes just like regular Safety Matches. As the victim tries to light one he gets quite a surprise.

10c

Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

MIDGET BIBLE

GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp. 200 Pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE 15c each. 3 for 40c, 12 for $1.35, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

Rubber Chewing Gum

10c Pkge. 3 for 25c P.Pd.

It is just like a regular package of chewing gum and looks so real that it fools everybody. Of course no one suspects it is not genuine until they start to chew it. There's a world of fun in this rubber chewing gum—5 sticks to the package. Price, 10c Pkge.; 3 for 25c; 12 for 75c postpaid.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price 10c, 3 for 25c, 1 dozen 75c. Johnson Smith & Co.

Every Boy His Own Toy Maker

A great book for boys. It gives plain, practical instructions for making all manner of toys, machines and other articles, amusing and useful. Tells how to make a Steam Engine, a Photographic Camera, a Windmill, Microscope, Electrical Machine, Galvanic Battery, Electric Telegraph, Electrotyping Apparatus, Telephone, Kaleidoscope, Magic Lantern, Aeolian Harp; how to make Boats of all kinds, Kites, Balloons, Paper Toys, Masks, Card Racks, Wagons, Carts, Toy Houses, Bows and Arrows, Pop Guns, Slings, Fishing Tackle, Rabbit and Bird Traps, etc. 200 Illustrations. PRICE 25c Postpaid. JOHNSON SMITH & CO.

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enameloid, as illustrated. Price, only 25c Postpaid. Johnson Smith & Co.

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which curls and twists about in a most life-like manner. Price per box, 10c postpaid, 3 for 25c.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs

Special Offer
1 Blank Cartridge Pistol
100 Blank Cartridges
1 550-page Novelty Catalog
ONLY $1.50 The Lot
Shipped by Express Only
Cash With Order Only

Well made and effective, modelled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .22 Cal. Blank Cartridge—obtainable everywhere. Special cash with order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges, and our new 550 page De Luxe Catalog of latest novelties; all for ONLY $1.50. Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy Type) for pistol 50c. No C.O.D. shipments

THROW YOUR VOICE

Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it.

Never Fails. A 16 page course on ventriloquism, the Ventrilo, ALL FOR 10 CENTS

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment . . . $1.00

Anyone Can Do Them

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. Price complete $1.00 postpaid.

U. S. BABY TANK

It goes with real Yankee Pep—by its own power

25 Cents

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same lifelike manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run for toys. It will perform dozens of the most wonderful stunts; it will go backward or forward at will; 2¾ inches long. Price only 25c prepaid. JOHNSON SMITH & CO.

Look 35¢ Look

Wonderful Instrument.

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngascope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00
JOHNSON SMITH & CO., DEPT. 821, RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 821 RACINE, WIS.

A De Luxe Edition of our new 1928 CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Stamps, Coin, Money Order, Check, etc. Unused U. S., Canadian and Foreign Stamps also accepted.

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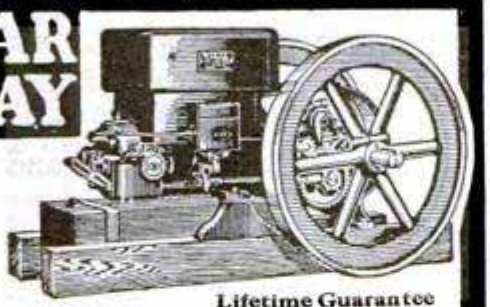
A YEAR TO PAY



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Users say it is almost mysterious the way **WITTE Engines** purr under the heaviest loads. "Amazing"—best expresses the marvelous flow of power now made possible by the **50 New Feature Refinements**—but send for the **free Book.** Read for yourself.

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Easy Payments? Certainly. You'll never miss the money. **New Low Prices.** Tremendous savings made possible by Factory to User plan.

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KEROSENE GASOLINE GAS OIL DISTILLATE OR GAS

$1 DOWN

21 Jewel Burlington

Nothing less than 21 Ruby and Sapphire jewels is good enough for the Burlington masterpiece.

Quality and Style

Adjusted to the second—temperature—isochronism—positions. 25 year Gold Strata Case, in 100 designs. $1 down. Balance in small monthly payments. **Send for free book.**

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Your Coat and Vest Can Be Matched with New Trousers

Save the price of a new suit. We match hundreds of coats and vests satisfactorily every day. Each pair tailored to your measure. 80,000 patterns. We submit sample of cloth for your approval. Just mail your vest or a sample of the suit.

We employ no agents.

Enclose return postage if vest is sent.

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MAKE YOUR RADIO AN ELECTRIC SET

with a TOWNSEND "B" Power Unit *at a cost of only* $6.85 Complete

Why pay up to $450 or more to own an electric set when you can quickly and easily make your own set all electric in this new, surprisingly inexpensive way?

APPROVED by the laboratory tests of Radio News, Popular Radio

We show you how. Write for full information

Townsend Laboratories
713 Townsend Street - Dept. 15 Chicago, Ill.

Here's an Amazing New Business THAT PAYS UP TO $1,000 A MONTH

MEN, here is a real, red hot money-making opportunity! It's a chance to jump into business for yourself and make more money every week than the average man makes in a month.

Surprising as it may sound, we actually put you in a business, with the first day's profits often running from $18 to $55. $350 to $600 the first month is not unusual for ambitious men.

Cut in on the Big Money

All you need is the ambition to make real money. We supply you with complete equipment to make and sell that famous new food specialty—Brown Bobby—a greaseless doughnut baked by electricity!

It's a crispy, flaky, delicious new kind of doughnut cooked without one drop of oil or grease. Easily digested by everyone. More appetizing than old-style doughnuts ever were. Costs less to make. Sells four times as fast. No baker's skill required. Just add water to our prepared "Mix."

You can open a shop; rent cheap floor space in a grocery, delicatessen, lunch-counter, drug store, etc. Or start at home—and make up to $250 your very first week.

"I made $3,000 in 3 months from my greaseless doughnut business!" — T. Chas. Minch, Fla.

Start At Once ANYWHERE!

Men and women everywhere are starting in this business daily! YOU cannot afford to delay! Details will gladly be sent without obligations of any sort. Such an amazing money maker may never come your way again. So fill in and send the coupon at once! TODAY!

MAIL COUPON NOW!

Food Display Machine Corp.,
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Gentlemen: Please send me the plan by which I can **cash in** on Brown Bobby, the Greaseless doughnut. It is understood that this obligates me in no way whatever.

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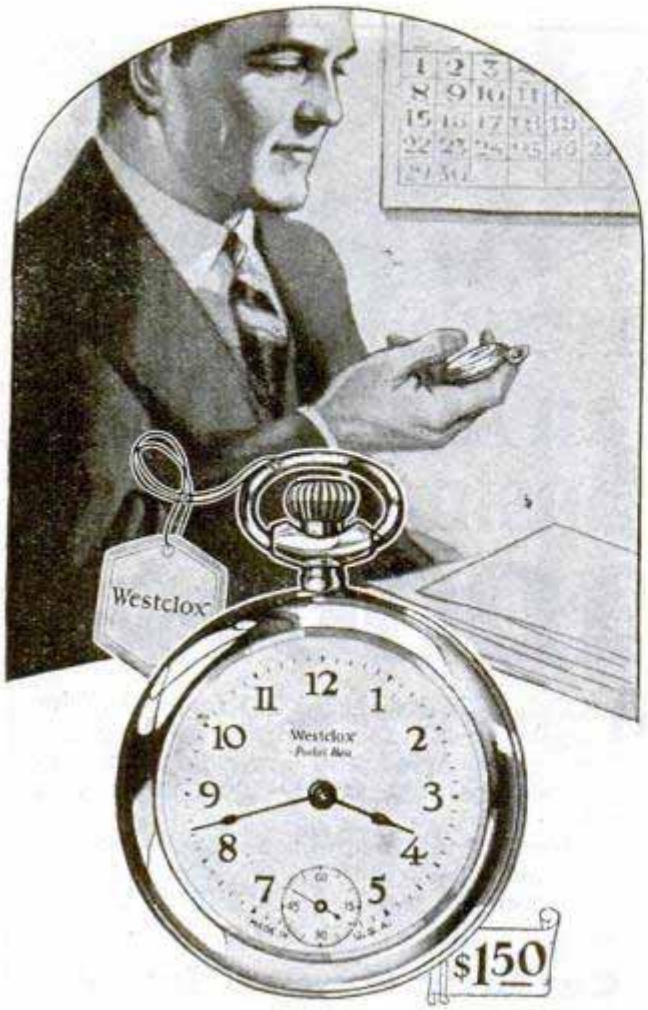
Address.....

City.....State.....



New Model

Pocket Ben

The busier you are, the more you need a reliable watch.

This new model Pocket Ben is that kind—and it's not only good-looking but sturdy—dependable.

Sold everywhere for $1.50. With night-and-day dial, $2.25.

Built by the makers of Big Ben and other Westclox

WESTERN CLOCK COMPANY
La Salle, Illinois

New Auto Clock

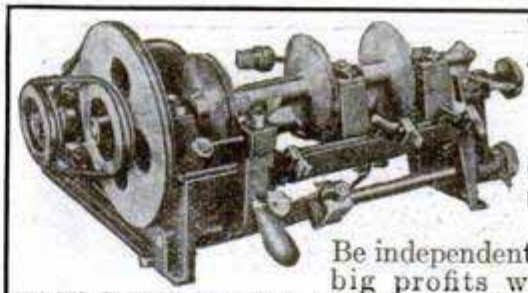
Attractive, convenient, reliable. Fits any car. Quickly attached on dash or above wind-shield.

Signed off

THAT's what my set did. Loose ground-wire. Found it in a jiffy with my flashlight. Everything okeh in a minute. Might have missed another good "Eveready Hour" if I hadn't had that flashlight.

A flashlight is certainly the handiest household implement we own. I wouldn't use any but genuine Eveready Batteries in ours—same brand as on my "B" circuit. Dependable—they are always *there* with light when you need it.

Get the flashlight habit—it's one you won't want to break. And always use Eveready Batteries.



DON'T BE A SLAVE

Be independent and make big profits with the—

NEW IMPROVED BEISSER KEY MACHINE

You can start a business of your own, no experience necessary. The only key machine that cuts ALL kinds of keys. No hand-filing. Make first keys by number without taking locks apart. Locksmith instructions furnished free. *Write today for Full Particulars.*

BEISSER KEY MACHINE COMPANY
407 Fort St. East Detroit, Mich., U. S. A.

$9,600 a Year Chance For Young Married Men

If you are under 35 years old, ambitious, honest and married, this concern selling $10,000,000 yearly can use you. Experience and education do not count. We have taken men earning less than $40 a week for our work of responsibility and big earnings.

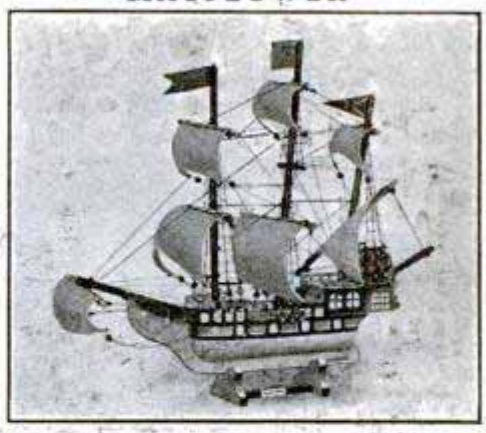
WE TRAIN YOU FREE

We train our own men. No matter what you now are doing, you should investigate this opportunity. Our company is a great national organization with several $9,600 to $27,000 a year executive positions open. Act today. Don't fear $9,600 a year. We will quickly train you for bigger jobs and earnings at our own expense. Address

THE CLUB ALUMINUM CO. 1045 Lawrence Ave. Dept. D-110. Chicago

SANTA MARIA

MAYFLOWER



$4.75

COMPLETELY ASSEMBLED

PAINTING AND RIGGING IS ALL YOU DO

Instructions so clear and simple, that you enjoy Painting and Rigging it yourself. You will have the satisfaction of telling your friends that it was finished with your own hands. It certainly is a thing of beauty and antiquity when finished. Picture it in that corner which has always lacked something. It will add just enough color and mellow antique to make that spot dear to you.

Santa Maria—has decorated heavy canvas sails, flags and shields. Size 25" high x 26" long x 10½" wide.

Mayflower—has plain heavy canvas sails and decorated flags. Size 26" high x 27" long x 10½" wide. There is no extra charge made for decorations on sails, flags and shields of either model.

Santa Maria and Mayflower ship models—Completely finished and artistically decorated by our own craftsmen. They really present most striking and distinctive ornaments wherever used.

f. o. b. Philadelphia $11.95 each

Giftcrafters

MASCHER & TURNER STS., PHILA., PA.

GIFTCRAFTERS, Dept. 14-A.
N. E. cor. Mascher and Turner Sts., Phila., Pa.

Please send me completely assembled Ship Model, ready for Painting and Rigging.
SANTA MARIA [ ] MAYFLOWER [ ]
(Check model desired)
and upon delivery, I will pay Postman sum of $4.75 plus a few pennies extra, parcel post charges.

Please send me completely finished and artistically decorated Ship Model.
SANTA MARIA [ ] MAYFLOWER [ ]
(Check model desired)
and upon delivery I will pay express company sum of $11.95 plus small express charges.

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Address.....
City..... State.....

All orders outside of the United States of America must be accompanied by money order.
To insure correct shipping PRINT name and address.

EASY $100 a Week

FUGO FIRE EXTINGUISHER

Unusual opening for live agents in every locality. Make $5000 or *more* a year—*easily*. Fugo—the instantaneous automatic fire extinguisher—is needed and wanted in every home, store, theatre, garage, shop, school, automobile, etc. Cheapest fire protection available today. Within reach of all.

1 Qt. Size $5.00 2 Qt. Size $7.50

Recharged in a jiffy

Amazing 30-second demonstration clinches sale—each one sold sells others. Territory going fast. *Write at once for wonderful proposition that will make you big money.*

THE NATIONAL FORMETAL CO.
6535 Metta Ave., N. E. Cleveland, Ohio

Fits top of any distilled water bottle. Sent post paid upon receipt of 35c in stamps or money order.

JOS. A. ROBERTS

P. O. Box 470 Trenton, N. J.

WANTED

500 dissatisfied POULTRY RAISERS

to begin retailing Rawleigh's Good Health Products to your neighbors. Easy to sell monthly $250-$500 worth of flavors, spices, food products, toilet preparations, medicines, soaps, veterinary and poultry products. Over 150 different daily necessities used by yourself and your friends. No selling experience needed—we show you just how to succeed. Low prices. Good values. Complete service. For free particulars

Send this coupon!

W. T. RAWLEIGH CO. Dept. 5 PPM Freeport, Ill.

Please tell me how I can make more money

Name.....

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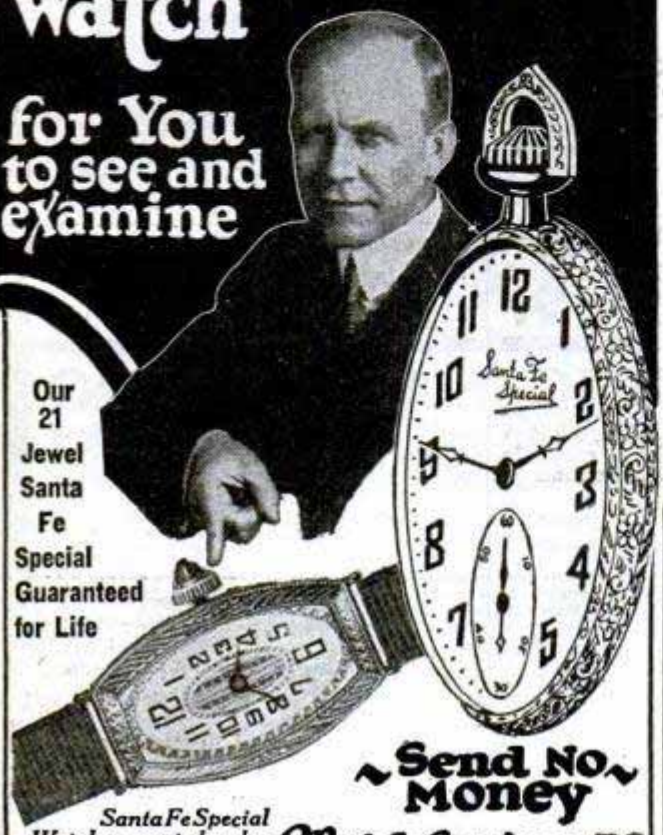
City..... State.....

I Want to Send You a Santa Fe Special-Watch

for You to see and examine



Our 21 Jewel Santa Fe Special Guaranteed for Life

~Send No~ Money

Watch Sent on 30 Day Free Trial

Santa Fe Special Watches are today being shipped to every civilized country in the world, and are probably the best and most favorably known watch in both Army and Navy.

In addition to our NEW LOW PRICE, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. So accurate, Government officials carry them; so perfect and beautiful, jewelers say they are worth 1-3 to 1-2 more than we ask for them. I will send you one to see WITHOUT ONE PENNY DOWN—allow you to wear it 30 days FREE—then sell it to you on easy payments.

WHY NOT OWN A 21 JEWEL SANTA FE SPECIAL WATCH?

You will never miss the few cents a day that will make you own one of these watches—SEND FOR WATCH BOOK—illustrating in beautiful colors hundreds of designs and combinations in cases in the POCKET WATCH, MEN'S STRAP WATCH and LADIES' WRIST WATCH. You can have your name or monogram and any emblem you may desire engraved in the Case to suit your own ideas. Write today for Free Watch Book, and make your selection at once, while this offer lasts.

FREE **A limited offer! With every Santa Fe Special, beautiful gold chain or strand of exquisite pearls.**

Write today. Mail coupon for both Watch and Diamond Catalog

SANTA FE WATCH COMPANY
46 Thomas Building **Topeka, Kans.**

(Home of the Great Santa Fe Railway)

Mail coupon today!

SANTA FE WATCH COMPANY
46 Thomas Building, Topeka, Kansas

Please send prepaid and without obligation your Watch Book Free, explaining your "No Money Down" Offer on the Santa Fe Special Watch.

Name.....

Address.....

City..... State.....

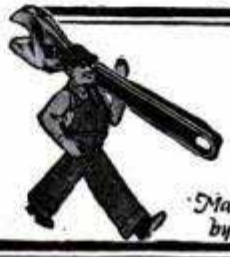
A NEW LOW PRICE ON THIS FAMOUS PLIER!

Now 25¢

The well-known Cee Tee Co. Plier is now only 25c. It is the same quality tool which formerly sold at 30c. Never before has such a sturdy and substantial plier been offered at this low price. Like all Crescent-Smith and Hemenway Tools, it is guaranteed to give absolute satisfaction or you get your money back. At your hardware dealer.

CRESCENT TOOL COMPANY
210 Harrison Street, Jamestown, N. Y.

WRENCHES
PLIERS
SCREW DRIVERS
CHISELS
PUNCHES
AUGER BITS
SNIPS
HACKSAWS
NIPPERS
ELECTRICAL TOOLS



CRESCENT and Smith & Hemenway TOOLS

Made under the supervision of and guaranteed by the originators of the Crescent Wrench

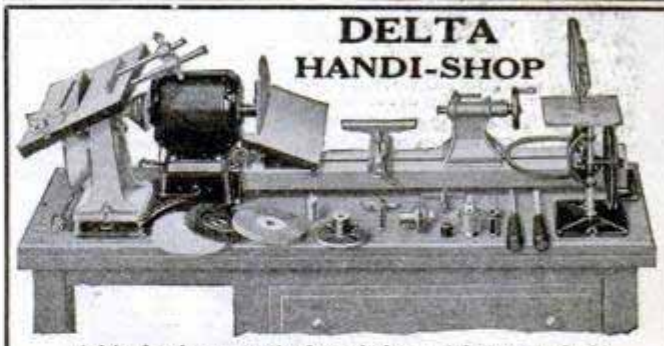
ALLADIN GOOD LUCK RING, ENTIRELY NEW

Made of jet black Ebonite inlaid in silver. Alladin and Lamp crest on top. Magic wand on each side. Beautiful to look at. Different from anything you have ever seen. Ladies and gentlemen both. Just send name, address and finger size. On arrival pay postman $1.49 and postage. Cash with Canadian or foreign orders.

$1.49 C. O. D.

ORECK'S, 120 So. Wabash Ave. Chicago, Illinois

DELTA HANDI-SHOP



A big, husky, practical workshop with a two-shaft motor so as many as three tools are always ready for work. Every one of the many accessories is full-sized — every one a nationally known product. There is no other workshop that offers so much actual machine-value per dollar.

Send the coupon for full particulars

DELTA SPECIALTY CO., (Dept. MP428)
858 3rd St., Milwaukee, Wis.

Send me your illustrated color folder describing Delta Handi-Shop. Tell me about your Free Trial Offer. Free blue prints and Easy Payment Plan.

Name .....

Street Address.....

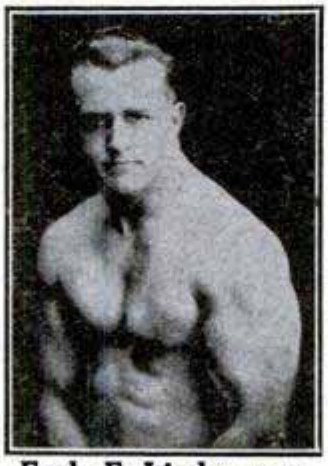
City..... State.....

Whom the Gods Would Destroy They First Fatten

YOU know there's another one ready for the undertaker whenever you hear this expression, "And he was such a fine, big, healthy-looking man, too!"

You can't kid Nature for long. During those first few years of your youth keeping fit is easy, but after that, *beware!* You might be big and healthy-looking, but if it's fat that makes you big—boy, you're sure out of luck.

Take a look at yourself in the mirror. How's the old waist line? Are your arms flabby and fat, or real, solid muscle? Can you stoop over and touch the floor without bending your knees? Do you get out of breath after climbing a few stairs?



Earle E. Liederman
"The Muscle Builder"

Author of "Science of Wrestling and Jiu Jitsu," "Muscle Building," "Secrets of Strength," "Here's Health," "Endurance," etc.

The photo above shows Waldo E. Smith BEFORE following Liederman system.

Fat Means Danger

Yes, I thought so. You're a fine, big, healthy-looking man, but you're full of fat, and not muscle. *And fat means danger!* Ask any insurance company or any doctor. They know that a fat man seldom lives as long as the man whose weight is normal. And that's just where I come in. I'm the fat man's best friend. I add years to his life.

I Do Two Things At Once

I don't just take off fat. I'm not only a reducer—I'm a Muscle-Builder. I take off the old grease, and put real strength in those lean, steely muscles that are left in its place. When I get through with you there isn't a man in the world that will be able to call you "fatty." *And the real wonder of it all is that you'll be stronger, not weaker by reducing my way.* It's not hard, and you don't have to fast either, or diet.

But, boy, when I get to work on you, it sure works quick. In just 30 days that old pot-belly will look as though somebody clipped it off with a scissors. And when the day's work is done, and night comes you'll be eager to step on the gas and do things. You'll feel younger, look younger, and act younger. And what a lot of scrap and pep and vitality you are going to have.

And if you think that 30 days with me has done wonders for you, wait till you see yourself at the end of ninety days. Then, as you stand before your mirror and see that wonderful, muscled example of perfect manhood, you'll know what I mean when I say I do two things at once, *build muscle and take off fat.*

Above photo shows Smith 4 months AFTER following Liederman system.

I Guarantee to Do These Things

One thing more! I don't just make promises. *I guarantee to do these things.* I've helped over a hundred thousand men already, and I have letters from all over the world from grateful men who took my course and were brought back to happy health and longer lives.

Send for My Free Book

"Muscular Development"

and my new free pamphlet "Whom the Gods Would Destroy They First Fatten." It's the first step to a fat man's salvation. Look over the 48 pages of photos of muscular marvels. Many of them were fat men before they came to me. It's so good, it is a bargain for a skinny man. Write me today!

EARLE E. LIEDERMAN
Dept. 2004A 305 Broadway NEW YORK CITY

Mail This Coupon Now

EARLE E. LIEDERMAN,
Dept. 2004A, 305 Broadway, New York City.

Dear Sir: Please send me, without any obligation on my part whatever, a copy of your latest book, "Muscular Development," and your new pamphlet, "Whom the Gods Would Destroy They First Fatten."

Name.....

Street.....

City..... State.....

(Please write or print plainly)

Outselling because it is the Better Spark Plug

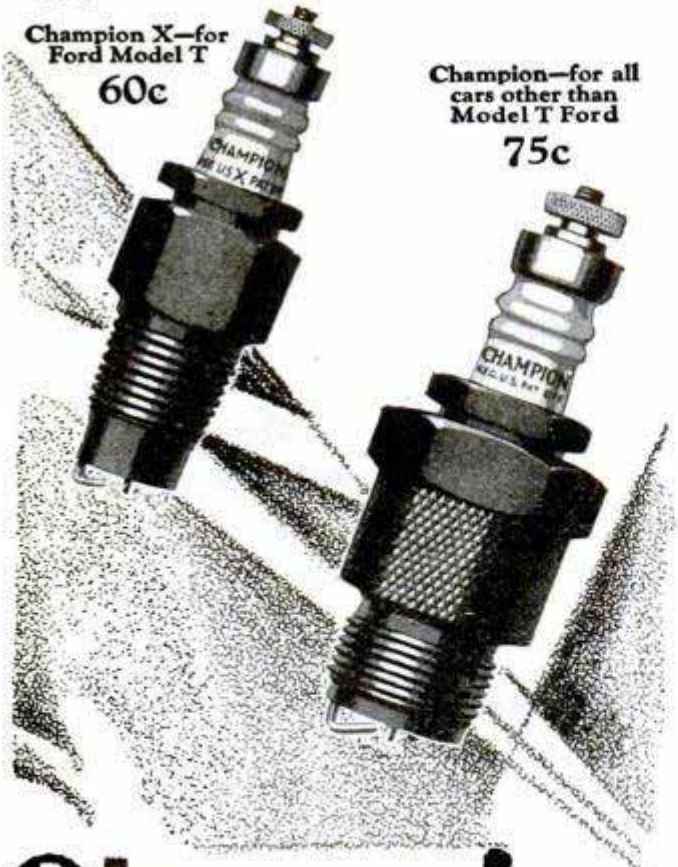
TODAY, more than ever before, Champion merits the world preference which enables it to outsell, two to one.

For, today, Champion is better than ever before with new improvements and new advances in spark plug design, including:

The exclusive Champion sillimanite core which resists the higher compression of the modern engine—a new sillimanite glaze which keeps free from carbon and oily deposits—a new, patented compression-tight gasket seal—and improved special-analysis electrodes assuring a fixed gap.

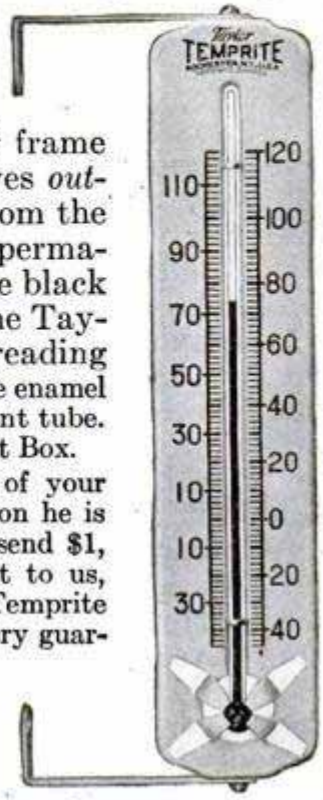
Champion X—for Ford Model T
60c

Champion—for all cars other than Model T Ford
75c



Champion
Spark Plugs
TOLEDO, OHIO

Taylor TEMPRITE
Window Thermometer



Attaches to window frame on the *outside*. Gives *outside* temperatures from the *inside*. Brilliant permacolor filling and large black graduations make the Taylor Temprite easy reading at long distances. White enamel on steel back. Lens front tube. Packed in attractive Gift Box.

Get Taylor Temprites of your dealer. If for any reason he is unable to supply you, send $1, plus 10c postage, direct to us, and we will mail you a Temprite immediately, safe delivery guaranteed.

Price $1.00

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If you work with WOOD

You all know about the standard, light-weight Take-about Sander, the hand-belt surfacing machine that sands, scrapes and planes 5 times faster than by hand. Learn now about the latest model—the new

TAKE-ABOUT SUPER Sander

Super-power—so much reserve power you can can on it without stalling it.

Highest Speed. Belt speed 2000 ft. per min.

Very Large Motor—Detachable. Develops 1 h. p. Three screws attached to frame making motor easily removable. For maximum cooling an air space between the motor housing and the field. Sturdy construction. Let us tell you about its many exclusive advantages and all it will do for you.

Price only $85.

Write for our printed literature—or better still, a free demonstration.

PORTER-CABLE MACHINE CO.
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Knives That Bite

R 4413

A Light Weight Knife for Heavy Work

The blades in this knife are super-sharp—hand-honed at the factory.

They are made of the best high-carbon blade steel obtainable, uniformly hardened and tempered to the proper degree. The edge that bites will last.

This knife is light in weight. You can carry it in your pocket without knowing it's there, but it is sturdy—built for hard, practical use by carpenters, skilled mechanics and amateur craftsmen.

Has a good-size, heavy-gauge clip blade, a pen blade and a cut-off pen blade for scribing, cutting builders paper, canvas or other heavy material. Shinbone stag handle with spun rivets — no cracked handles due to hammered rivets. Nickel silver bolsters and shield. Brass linings. Beautiful finish throughout.

Ask for Remington Knife No. R4413. Sold wherever good cutlery is sold. If your dealer hasn't it in stock, send us his name and $1.50. The knife will be forwarded promptly, postpaid.

Remington Arms Company, Inc.
25 Broadway New York City

Remington

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How We *Win* Men
To Our New Shaving Cream

A 10-day test at our expense that proves to 85% of those who try it that the claims we make are based on fact

GENTLEMEN:

No man is ever convinced against his will. And extravagant claims fail to impress when the product itself cannot live up to them.

So in introducing our new shaving cream to you we discard bombast and boasting, and rest our case flatly on your decision after you have made a suitable trial of the product itself.

Now we offer you a ten-day test, at our expense. We expect it to prove to you in your own bathroom that this is the finest shaving cream you have ever used. Our whole case rests on *merit alone* convincing you.

These 5 things you wish

1. Multiplies itself in lather 250 times.
2. Softens the beard in one minute.
3. Maintains its creamy fullness for 10 minutes on the face.
4. Strong bubbles hold the hairs erect for cutting.
5. Fine after-effects due to palm and olive oil content.

Now mail the coupon

We take the risk—not you. We undertake to please you . . . to win you in ten shaves. Won't you mail the coupon, please?

THE PALMOLIVE-PEET COMPANY, CHICAGO, ILL.

10 SHAVES FREE
and a can of Palmolive After Shaving Talc

Simply insert your name and address and mail to Dept. B-1476, Palmolive, 3702 Iron St., Chicago, Ill. Residents of Wisconsin should address Palmolive Milwaukee, Wis.

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3930 (Please print your name and address)

SW

The GOVERNMENT

Picked This Watch

FREE Trial!

WORLD-FAMOUS Illinois "SPORTSMAN" Double-Duty Strap Watch. For SPORTS-wear! For DRESS-wear! Has remarkable WEATHERPROOF movement, secret process tempered. Genuine Jewels—not 7, not 15, but 17 JEWELS for **Precision!** Created by the Illinois Watch Company, Springfield, Ill. The U. S. Government during the World War requested their entire output of Strap Watches because they proved best.

BUSINESS men, Professional men, Sportsmen, Aviators are astounded at its AMAZING performances under gruelling action! Intense heat or cold do not affect it! It is WEATHERPROOF! Has radium dial—GLOWS time brightly in darkness. Handsome Cushion shape. List price, $50. Our price to advertise our "Direct-by-Mail" Values..... **$33.95**

Our Plan is Different!

It is arousing nation-wide comment! We ask for NO money in advance! NOTHING on Delivery. See, try, test, ENJOY, "Sportsman" for 10 Days **ABSOLUTELY FREE!** If pleased you may pay on Budget Plan: **$6.00 MONTHLY**

If you prefer to pay cash at end of 10 DAYS, deduct $2.70 and send Check or Money Order for $31.25 in FULL SETTLEMENT. Otherwise return it. Order NOW at this Special Price! **$31.25**

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Importers, Exporters, International Mail Order House "2 Generations of Honorable Dealings"

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Sole Distributors of WEATHER-PROOF "Sportsman"

Gentlemen:—Send me $33.95 Illinois "Sportsman" Watch for 10 days' FREE TRIAL on your "NO Money in Advance—NO Money on Delivery" Plan.

Check color of Case. [ ] Green. [ ] White.

Name.....

Address.....

Tear out—mail coupon NOW! If a new customer please tell something about yourself. We will appreciate and respect the information. THANK YOU. Pop. M. 4-28

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The **Quad**

Super Elto

4 Cylinder Outboard Motor

OLE EVINRUDE'S sensational new achievement. Develops 18 H. P. — easily drives stock racing boats better than 35 miles per hour. Drives sturdy runabouts 25 m. p. h. Absolutely vibrationless. Dual ignition, dual carburetion, instant starting. Terrific, zooming acceleration, exceptional handling ease. Weighs only 92 pounds. Send for free book on the *Three Great Super Eltos*. Describes the 4-cylinder *Quad*, the new B Class *Speedster* and the famous *Service Twin*. Write today.

ELTO OUTBOARD MOTOR CO.

Ole Evinrude, President

Mason Street Department AA Milwaukee

PORTABLE

WONDER SAW

MODEL 3-A

BUILT-IN MOTOR

Not a toy, adaptable for use in schools, laboratories, pattern shops, manufacturing and home use. It rips, crosscuts, also jig and scroll saw. Automatic splash lubrication. Operates from light socket. Write for further information—

$22.50 to $42.50

THE MACHINE CRAFT CO.
VALPARAISO : INDIANA

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THE SPEEDY RULE

"Interlox"

MASTER SLIDE RULE

A direct-reading *inside caliper.* Fine for outside measurements too. Quick, strong, durable. All lengths, 2 to 8 ft., 20c per lineal ft. If not at dealers, sent postpaid.

Master Rule Mfg. Co.
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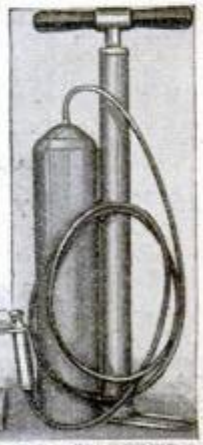
Dealers and Agents: Write for attractive proposition.

DO *ALL YOUR OWN* PAINTING

New—Quick—Easy Way—By Air—No Brush



NOW anyone can own and operate a spray outfit and apply lacquers, brushing lacquers, varnishes, enamels, paints, etc. The KB SPRAY GUN makes painting easy; gets into the most intricate places where it would be impossible with a brush. A wonderful smooth-glass-like finish is applied with this New Hand Operated KB SPRAY GUN on Automobiles, Furniture, Wicker Ware, Screens, etc., in fact, on anything in and around the house. Women are delighted with it. Makes painting a pleasure. THROW AWAY THE OLD BRUSH.

MAKE $100 TO $250 A WEEK (NO EXPERIENCE NECESSARY)

On account of the unusual demand for this wonderful KB Hand Operated SPRAY GUN it opens big money-making possibilities in every locality, everyone is interested in this marvelous outfit when they see the excellent work it does. A great many homes have been brightened with this amazing outfit and thousands of homes are anxious to get it. Be the first in your locality.

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Special Offer
COMPLETE OUTFIT
Only $9.75

AGENTS WANTED

NOW "how easy" YOU CAN FILTER

for the Ideal Home

Your Own Beverages, Liquids, Medicines, etc.

HERE is an entirely NEW PROCESS that scientifically filters and eliminates the sediment and solid matter, without affecting the flavor, odor, strength or taste and leaves the liquid crystal clear (Kristal Klear).

Does away with fitting filter paper and will filter clearer and quicker than any device of its kind. Has an adjustable packing gland. Old process required hours for a few gallons: NOW reduced to minutes.

Easy to Clean

The fluid is filtered through perforated discs that are easily taken apart and cleaned, making it a very sanitary filter.

Clear as a Crystal

Years of exhaustive tests enable us to offer a filter that is faultless and filters the liquid clear as a crystal.

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Kristal Klear Filter Device

Dept. 53

4556 Virginia Ave. Chicago, Ill.

Filters Your Drinking Water Direct from Your Faucet

Just as its name implies, it will filter any liquid crystal clear with a sparkling brilliancy that is admired by everyone. Your HEALTH demands clear drinking water and you can NOW have all the filtered water you want Direct From the Faucet through the KRISTAL KLEAR FILTER.

Kristal Klear Filter

Removes All Foreign Matter

It is surprising how much foreign matter there is in regular drinking water. This can all be removed NOW with a KRISTAL KLEAR FILTER.

Nickel Plated—Highly Polished

Agents Wanted Everywhere

SPECIAL OFFER
Filter Complete
Only $9.75
State Fitting

PORTABLE PHONOGRAPH Given

Handsome grained leatherette case, weighs only 8 pounds. Wonderful tone production loud as large cabinet machine. Powerful motor. Fully guaranteed in every respect. Plays all records up to 12 inches.

Send Name and we will send 24 art pictures to dispose of on special 25c offer. Remit according to our easy plan and we send the wonderful portable EDL Phonograph and 3 large 10-inch double face records. Most wonderful phonograph offer ever made. Write today.

E. D. LIFE, 337 W. Madison St. 4 PT 91 CHICAGO

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Want to make $20 a day? Want $5 an hour for your spare time? Send for this big FREE Tie Outfit . . . Ties styled on Fifth Avenue where real style grows. Ties men and women buy on sight. Stores can't compare nor match them. Spring line now ready.

Write for Free Outfit—TODAY

PUBLIC SERVICE MILLS, Inc.

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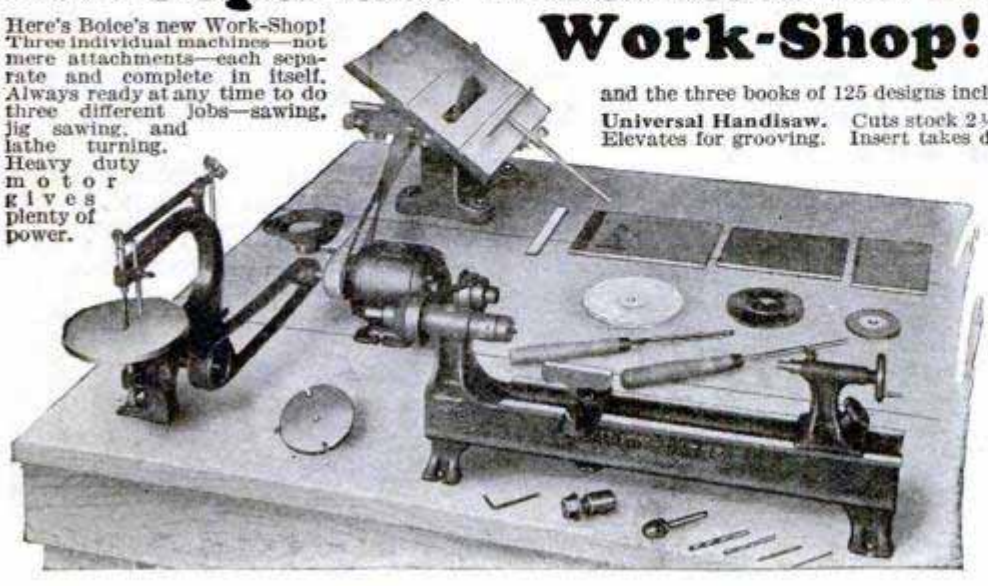
Canadian Office, 110 Dundas St., London, Ontario, Can.

All Separate Machines in Boice's Home Work-Shop!

Here's Boice's new Work-Shop! Three individual machines—not mere attachments—each separate and complete in itself. Always ready at any time to do three different jobs—sawing, jig sawing, and lathe turning. Heavy duty motor gives plenty of power.



Compare Boice's Work-Shop with any other for size, capacity and price. Think of the hundreds of jobs you can easily do with the saw, jig saw, lathe and the three books of 125 designs included in Boice's Work-Shop.

Universal Handisaw. Cuts stock 2½". Elevates for grooving. Insert takes dado head 6"x1" and also cope heads and 8" sand disc. Jointer attachment fits on right of table. Guides always remain parallel to saw regardless of tilt or elevation of table. **Table 15"x17" tilts 45° for bevelling.** No other saw of equal cost has this feature.

New Jig Saw. Vertical stroke 1½". Saw-to-frame 10". Table tilts 45°. Uses blades ⅛" to ⅝". Bronze bearings.

Utility Lathe. Swings 8". 19" C. to C. 3 speeds. For wood or light metal turning.

Send 10c for New 1928 Catalog of 64 pages describing Boice-Crane Work-Shop, band saws, mortisers, circular saws, and books of designs on how to make furniture and toys.

W. B. & J. E. Boice,
Dept. P.M. 4-D Toledo, Ohio

$60 a Day!

Patented Master Suction Grip Ash Receiver. Holds to any surface — just press it on. Whirlwind Seller—Big Profit Maker.

With 4 New Amazing Plans and Suction Grip ASH RECEIVER for Autos, Homes and Offices

Yes! You can make $60 a day. My men are making that much and more right now!—with the handiest specialty that has struck the field in years. The Patented MASTER SUCTION GRIP ASH RECEIVER—absolutely new and practical—a marvelous little invention which holds to any surface, metal, wood, or glass by means of a SUCTION GRIP. A brand new and practical idea in Ash Receiver design. No screws, no holes to bore, nothing to hurt the furniture or wall to which it is attached. No tools necessary. Just press it on and it stays on. Comes off in a jiffy for emptying, then press it on again in a wink. Just what the auto owner needs on the dashboard. Keeps car clean. A wonderful convenience and protection complying with the automobile fire laws. Made of Durable Bakelite in Black, Brown, Green and Mottled. A color to harmonize with every interior. Can you visualize your vast market and unlimited sales possibilities for this new and novel Ash Receiver?—Auto Owners, Homes, Offices, men and women everywhere are your prospects. Priced so ridiculously low you sell two or more at a glance.

Sells for 75c—You Make 100% to 200% EVEN ON DEALER SALES.

SELLING TO DEALER PLAN PUTS YOU IN BIG PAYING REPEAT BUSINESS

Our four amazing plans outline a sure way of making big money selling to consumers, to dealers in quantities, and getting orders by mail from empty autos by distributing our patented self-selling envelope circulars. **Our dealer plan shows you how to make $60.00 a day by placing our "self-selling" display carton on twenty store counters, and building a steady growing repeat business.**

ORDER DOZEN OR SAMPLE

Send 50c for sample Cash Receiver or better still get started now, order one dozen Ash Receivers in assorted colors packed in display carton. At our dozen price of $4.50. Send full amount or enclose $1.00 Deposit. Balance C. O. D. You make $4.50 profit on the dozen. Our four amazing plans will be sent to you at once with dozen or sample. Act now and get in line for territory.

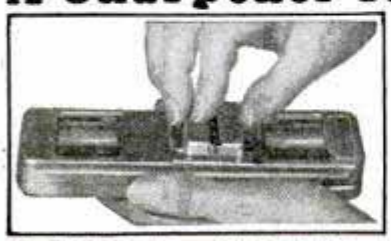
GORDON MANUFACTURING CO.
Dept. NC-9 110 East 23rd St., New York City

SELLS BATTERIES—PAYS FOR ITSELF

This HB Battery Tester shows customers how their battery acts under actual service—points out the weak cells, plates, connectors, etc. Extra battery sales will easily pay its reasonable cost in a short time. Only $7.00 monthly puts it to work for you. Write for detailed information.

HOBART BROTHERS, Box M-483 Troy, Ohio

A Sharpener That HONES as well as Strops



Zowie Blade Sharpener is the ONLY device for safety blades that gives *entire* sharpening principle of barbers. Shaving comfort incomparable. Fits all blades except Durham. Saves 5 times its cost in 1 year. Guaranteed 10 years.

30-Day Trial—We Pay Postage

You be the judge. Use it 30 days; then if you care to part with it return it for full refund. Send only $2.50 now as full payment.

ZOWIE AUTOMATIC BLADE SHARPENER

Agents: Keefer sold 7 in one office. Your $2.50 refunded when you have ordered one dozen. ACT QUICK!

ZOWIE MANUFACTURING CO., 2012 E. 105 St., CLEVELAND, OHIO

AGENTS

Here's a NEW ONE Automatic Traffic-Cop

The Best Back Seat Driver on the Road!
He does all the "stop" and "slow down" signalling for the driver without instructions from the front seat.

Greatest Car Novelty in Years!
All metal—lithographed in colors — durable — good-looking. Entirely automatic—no wiring — no battery — works entirely from momentum of the car—attached inside rear window in about 10 seconds.

$10 to $15 a Day
—and we don't mean maybe
Absolutely the greatest novelty ever introduced — the Safety - First Traffic Policeman. Not only good to look at, but of practical value. Auto owners buy it at sight—as fast as you can hand it out. Good for $10 a day easily as a side line and for twice that much as a full-time proposition. To show it is to sell it—no long sales talk necessary. Carry it in your coat pocket. No selling outfit required, just the sample to show.

Send $1.00 for a sample
Still better, send $6.50 for a dozen, and an extra demonstrator FREE. Act quick, territory going fast.

TRAFFIC COP, Dept. 30, 240 Clinton St., Buffalo, N. Y.

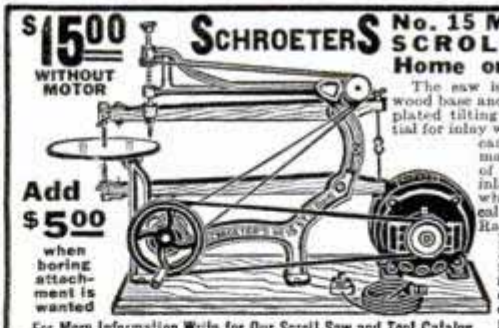
Make Your Radio "SAY" anything You Want!

THE SKY IS THE LIMIT
Brand New Idea for a Radio Party
The Mystic Home Broadcaster takes only a minute to insert. No skill required. Hide in another room or closet, sing, joke, play into the microphone. **Then the fun begins.** Slip a Home Broadcaster in your pocket. Try it at the next home party. **Send no money.** Pay postman $4.95 plus postage for microphone, special extension cord, adapter plug. **Money back guarantee. ELBA PRODUCTS Mfg. Co. 726 Atlantic Ave., B'klyn, N.Y., Dept. 104**

Be Your Own Broadcaster

$15.00 WITHOUT MOTOR

SCHROETERS No. 15 Motor Driven SCROLL SAW for Home or Small Shop



The saw is mounted on a neat wood base and has a 7½-inch nickel plated tilting table which is essential for inlay work. The work which can be accomplished is marvelous. Has a range of work from the finest inlay up to 7/8-inch white pine. A practical machine for sawing Radio panels such as bakelite, sheet brass, hard rubber, bone, fibre, etc. Has 16-inch swing. Weight only 21 pounds without motor. We supply a catalog of 250 miniature scroll saw designs with each machine.

Add $5.00 when boring attachment is wanted

For More Information Write for Our Scroll Saw and Tool Catalog

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sore throat

Absorbine, Jr. treats it both inside and out.

A gargle with a 10% solution of Absorbine, Jr. and water destroys germs; relieves irritation; soothes the inflamed tissue. Rub (full strength) on outside of throat. It relaxes the muscle tension; breaks up congestion.

At all druggists', $1.25. Send for free trial bottle.
W. F. YOUNG, Inc., Springfield, Mass.

Absorbine Jr.
THE ANTISEPTIC LINIMENT

MADE $1200.00 NET PROFIT IN 90 DAYS

You Can Do It Too FREE Book Tells How-

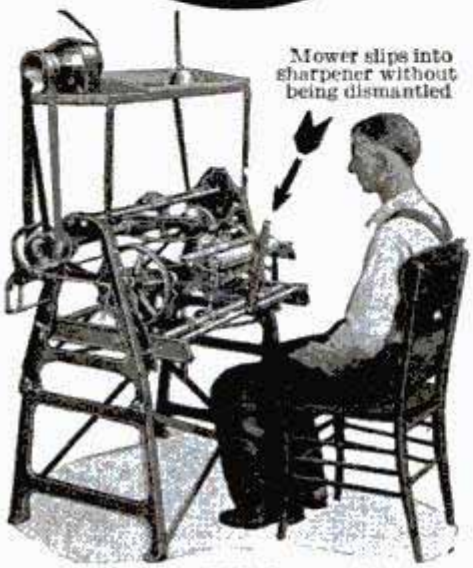
SEND FOR THIS BOOK

Here's Your Chance!

The big opportunity you've always wanted—to make extra money, BIG MONEY, in your spare time, at home. W. T. Moore, Twin Falls, Idaho, made a net profit of $1200 in 90 days. You can do it too—turn every spare hour into $4 to $6 profit with the

IDEAL LAWN MOWER SHARPENER

You, too, can make yourself independent, build a permanent, honorable, big-paying business with this "Ideal" Grinder—a wonderfully simple machine that sharpens all makes of lawn mowers perfectly, scientifically, without taking the mowers apart. Just pick up the mower, set it in the "Ideal," make a few simple adjustments and proceed to sharpen. In 15 minutes the mower is ready for the lawn, and you have made $1.50 to $2.00—depending on the charge you fix.



Mower slips into sharpener without being dismantled

Man, It's Amazing How Easy it is to make big money with the "Ideal." Anyone can do it! H. J. Nulick, El Dorado, Kans., turned his grinder business over to his 14 year old son.

$2100 Last Season
W. F. Kendt, Buffalo, writes: "I sharpened 994 lawn mowers last season and the receipts were nearly $2100—not bad for a side line."

Hundreds of Dull Mowers in your locality are waiting to be sharpened. No town too small. R. S. Newcomer, Vinton, Ia., writes: "People come for miles around and other towns to get their mowers ground." Your customers stay with you, too. The "Ideal" sharpens mowers to razor edge. Owners are delighted; tell their friends; your business grows by leaps and bounds.

You Make Money Right Away Geo. E. Kearney, Stillwater, Minn., writes: "We set the machine up 2 weeks ago Friday; since that time have sharpened 102 mowers." That's close to $200 in Kearney's pocket for 2 weeks' work!

This Is Your Chance, Man! Make Us Prove It
Our FREE BOOK, "Let George Say It," contains proof of what we say. Send today for it.

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SIGN AND MAIL THIS TODAY

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You'll have to prove that I can make big money with the "Ideal" Grinder. Send me your FREE BOOK.

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Seven Complete Motor Driven Tools

Big, new metal and woodworking shop for mechanics, householders and "handy" men. Attaches to lamp socket.

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Every tool in the new, Super Speedway Shop is high grade, for regular work. A money maker for the small job man. Get full particulars. Write today.

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Earn $100 a week selling Raincoats

You can make this much and more, just as our other representatives are doing. Selling is easy because we have the best values and the fastest service. Line contains raincoats and gorgeously colored sports slickers for men, women and children—some as low as $2.45. Get started now, by writing today for our fine FREE SELLING OUTFIT:

CONSUMERS MFG. CO., 720-28 Roosevelt Road, Dept. 407, Chicago

New Improved SPORS Fountain Pen. 60 Day Trial. Money back if not pleased

Agents' Sample 65c Sells for $1.25. Writes like a $7 Pen
Make $10 Daily Easily

LADIES' OR MEN'S STYLE
Comes in Green Moiet or Blue Marble
Guaranteed 2 Years
Improved Point

MADE $33 IN TWO DAYS
"Sold 44 pens Monday and Tuesday. Pens sell themselves. Rush 2 gross." Earnest Markle, Pa.

Write for FREE Wholesale Specialty Catalog.
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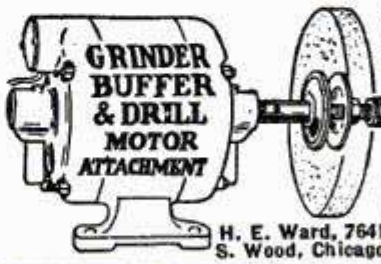
WRIST ADDING MACHINE

Size of a Dollar, Hang it on Watch Fob, etc. Capacity Ten Thousand. Push keys with pencil. Agents sell hundreds per day and make 50%, it sells to every body. Sample $1.00 prepaid to first Agents. 10 days money back guarantee.

E. R. HANSON CO.
REDSTONE, MONT.



H. E. Ward, 7641 S. Wood, Chicago

Holds saws, buffing, grinding, or scratch wheels up to 1½" thick. Hard steel, nickeled. Runs true. Fits ½" shaft.

WHEELS TO FIT
6"x½"—Grinding $1.05
6"x½"—Buffing ..... .45
6"x5/16"—Wire .... .95
6"x1" Bristle Brush 1.45

Write for Catalog
Motors, pulleys, saws, grinders.
Complete Attachment Postpaid ....

1.95 Each

Worth the Price the First Time Used

Jump Wire - 3ft Long

$1.00 Prepaid Anywhere

Try It LATEST 1928 METHOD FOR SOLDERING ARKO SOLDERING TOOL

works from any storage battery—heats instantly—can be used with Kester acid core or rosin core solder. Every mechanic is delighted with this new time saver. Sent with sample of solder prepaid in U. S. A. **Price $1.00.** Worth the price the first time used. Should be in the tool boxes of every Radio and Auto owner—connect to any live wire on the Auto or Radio with clips furnished. Can be used as a Cigar, Pipe or Cigarette Lighter. Keep it in your car.

ARKO MFG. CO., 180 PARKWAY, WINCHESTER, MASS.

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EASY to Play
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Gives You All These Features

Patented Snap-on Pads — the greatest improvement for beauty of tone—easy to replace—no more cementing. Found only on the Buescher.

Patented Automatic Octave Key — always positive.

Perfect scale accuracy — every tone always full, clear and true.

Hands never moved from one playing position.

Easier to play because of many exclusive improvements.

Convenient key arrangement, simplifies fingering of rapid passages.

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True Tone Saxophone

John H. Niles, Musical Director, Palace Theater, Northfork, W. Va., wrote: "I have used nearly every make of Saxophone and never found one I enjoyed so much. The tone is true in every respect from the low Bb to high F, something I have never found in any other instrument. Also it has a wonderful action."

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FREE Saxophone Book

Illustrates all the various models, and contains pictures of many famous professionals, also first lesson chart. Send your name for copy.

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A Liquid Solder You Can Depend On

Here is a liquid solder that is applied with a stick, without heat, and dries in twenty minutes.

It is the only known solder for aluminum and has been used successfully with radios, steam pipes, automobile radiators, cracked cylinder heads, gasoline tanks—in fact, any place a solder is used.

TISIT belongs on every work bench, in every garage, in every home, where it pays its small initial cost many times over.

50c at your dealer's. If he cannot supply you, send us 50c—money order or stamps—and we will ship you a bottle postpaid. Money back if dissatisfied.

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Desirable territories open for reliable representatives.

BUILD YOUR OWN GRANDFATHER'S CLOCK

We give blue prints and instructions with the works, dials, etc., which we furnish you at surprisingly low prices. You make a fine profit in your spare time building artistic clocks for your friends.

Plain Works as low as $5.00. Others with Chimes at all prices.

Ask about our FREE Blue Print Plan.

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Belle City Home Electric Hair Clipper

Anyone can trim or bob hair, shorten bangs, clip neck or underarms in a shape almost impossible with hand clippers or shears. Operates on direct and alternating current. Will not clog or cut the skin, and cuts as cleanly as a razor. Thousands in use. Rigidly guaranteed.

Fits Any Light Socket

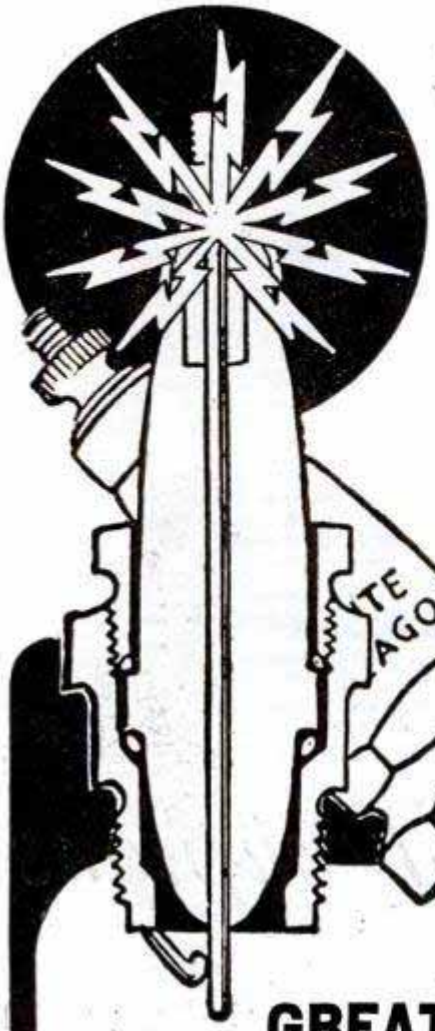
TEN DAYS' FREE TRIAL

If your hardware or electrical dealer can't supply you, write for interesting booklet, or order from this ad. Send no money—pay postman $8.75. Return it in ten days if not satisfactory. State whether 110, 220 or 32 volt current is used.

Dealers and Representatives Wanted

Belle City Appliance Co., 1022 12th St., Racine, Wis.

—If You Own a Car—You Can Obtain 30 Days' Demonstration FREE!



No Deposit No C.O.D.

NEW Spark Plug Fires Thru Oil

GREATER
Power — Pickup — Speed

The breath-taking courage of the Lydon Company in sending out millions of Lynamite Plugs on 30 days Free Demonstration is the biggest sensation of the year. Think of it! No deposit. No C. O. D. 3,000,000 already sold and paid for after 30 Days Free Demonstration.

Saves $2 on Every $10 Spent for Gas

The Lynamite method fires a 20% leaner mixture. Lynamite Plugs give any motor more speed, more power, quicker pick up. They produce a strong hot impact spark instead of the ordinary weak red spark. Ordinary spark plugs become dull and lifeless after a time. Lynamite plugs do not become dull. They last for years. They are so powerful THEY FIRE THROUGH OIL—prevent carbon. Let the Filling Stations pay for your new set of plugs. F. E. Erickson, County Treasurer, Takmoah, Neb., says: "I have used the same set of Lynamite Spark Plugs over two years and never had a miss. They have saved their cost because I quit buying spark plugs. They save gasoline and my car has more power than it ever had before." A. I. Etnier of Tyrone, Pa., writes: "I see right away I get more power than before. You surely can tell the difference the moment you put them in." Three million Lynamite Plugs in satisfactory use prove their worth!

Send Coupon for Free Demonstration Set

Simply fill out coupon at once for Free Demonstration set of Lynamite Plugs. Use thirty days entirely at our risk. See what wonderful results you get! Put them to every possible test and **See For Yourself.** Then either send $1.00 per plug, or simply return them to us. Do not waste one minute—fill in coupon and mail to us Today!

LYDON MFG. CO. Dept. 805-E
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We Pay Our SALESMEN up to $750 per month to give Car Owners a Full Set of LYNAMITE Spark Plugs on 30 Days' Free Demonstration

Do you wonder that our Salesmen make volume sales? We believe our new selling plan has no equal in the direct Selling Field!

Opportunities like this are "few and far between." If you are the man for whom we are looking, you will recognize this immediately. You will make up your mind to find out about our proposition that offers so many out-of-the-ordinary advantages. Then, because you know that quick action means more money, you will fill in the coupon and get it off without delay.

Lydon Mfg. Co.,
180 N. Wabash Ave.,
Dept. 805-E, Chicago, Ill.

Kindly rush full Set of Lynamite Spark Plugs for my own car. I will use the plugs 30 days and then either **send you** $1.00 per plug or return them. The demonstration is FREE. No deposit—No C. O. D.

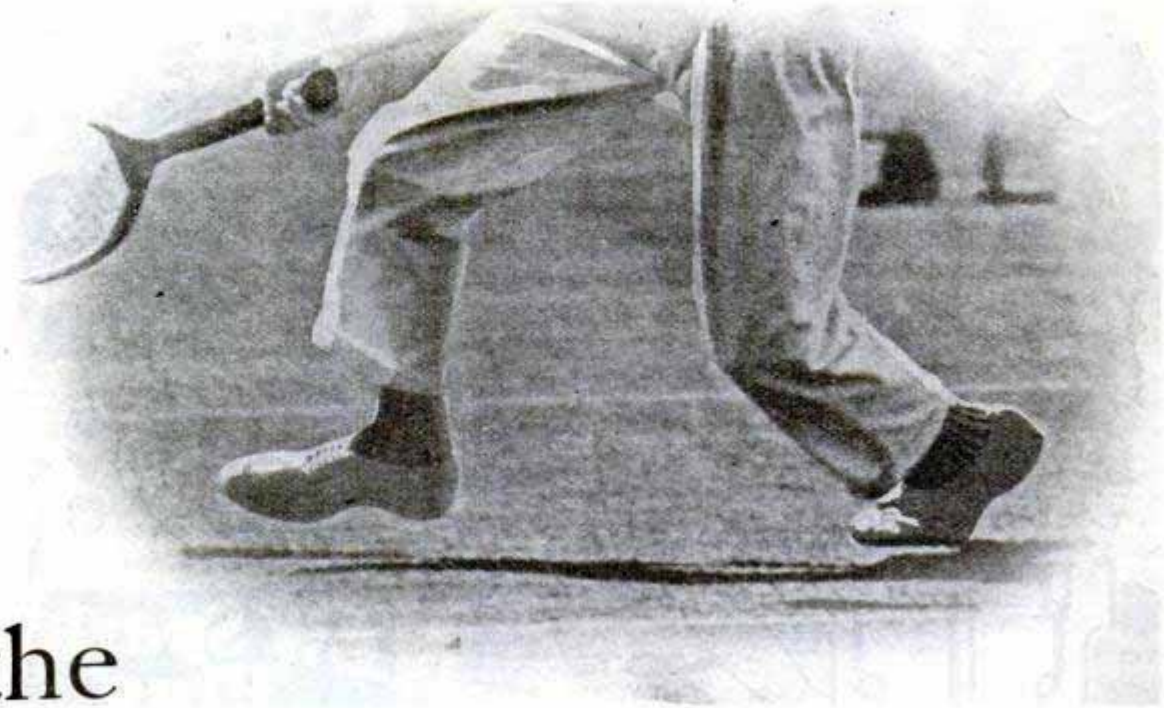
Send details of your new big-money agency proposition.

Address.....

City.....State.....

Make of my Car.....

Year.....No. of cylinders.....



On the Flying Feet *of Champions*

you will find these shoes

THE "GLADIATOR"
A sturdy athletic Keds. The special non-skid sole is stoutly built. Made in both white and brown.

THE "TRIUMPH"
A popular Keds model with vulcanized crepe rubber soles. A favorite, worn by nearly all the great tennis players.

KEDS have earned their title of the "Shoe of Champions." Today leading athletes in many branches of sport wear them. And coaches from coast to coast are recommending Keds to the players on their teams.

Keds' soles are made of fine springy rubber—built to grip surely on ground or floor. The uppers are light—yet strong enough to protect your ankles and foot muscles against sudden twists and sprains. And the special Feltex innersole gives you comfort every minute Keds are on your feet.

Keds come in all popular styles at prices from $1.25 to $4.50. *Ask for them by name and make sure that the name Keds is on the shoes.* For that name is your guarantee of getting the best dollar for dollar value in rubber soled footwear.

Write for our free booklet containing information on games, sports, camping, vacation suggestions and dozens of other interesting subjects. Dept. 2070, 1790 Broadway, New York City.

United States Rubber Company

1927 Championships Won on Keds

National Clay Court Singles
National Clay Court Doubles*
National Women's Doubles*
National Veterans' Doubles*
National Women's Indoor Doubles
National Women's Indoor Singles
National Indoor Mixed Doubles*
National Junior Singles
National Junior Doubles*
National Junior Indoor Singles
National Junior Indoor Doubles
National Boys' Indoor Singles
Intercollegiate Singles
Intercollegiate Doubles*
Ontario (Canada) Singles
All England Doubles
All England Mixed Doubles*
U. S. Professional Singles

*1 Player

All but two members of the United States Davis Cup Tennis Team of 1927 are wearers of Keds.

They are not **Keds** *unless the* name *Keds is on the shoe*

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Your Own Tire Business
Big Money! Independence!
QUICK SALES—LARGE PROFITS
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Get in business for yourself. Make big money. Become independent. Here is a going business waiting for you. The tire which has Revolutionized the Whole Tire Industry appeals to every auto owner. Gives him service. Saves him money. Easy sales. Demand created right in your locality through our National Advertising.

The most profitable business ever offered to Salesmen. Exclusive Territory now open for the World's Perfect Tire. One Representative only, to a Locality. $200 a week and over easily made. Dickinson Cord Tires *deliver absolute satisfaction.* Re-orders come without effort and pile up your revenue. Every tire made for Strength, Speed, Service and guaranteed for one year against all *road hazards* regardless of mileage.

The Dickinson Cord Tire is as far ahead of the Tire Industry as the automobile of today is ahead of the car models of twenty years ago. It is made by the *Dickinson Automatic Tire-Building Machine*, of which we are the *exclusive users.* From core to tread, it is built with automatic precision. No misfits. No hand mistakes. Every tire perfect and a racing tire with triple Life, Comfort and Economy.

The Dickinson Cord Tire embodies correct motor-traction principles *never before applied.* Proof against "stone bruise" and that old bogey "blow out." 100 per cent pure "live" rubber. Truly a tire for the classes—those who want only the best. Costs user nothing, as saving in gas ranges from 10 to 17 per cent.

This unusual Salesman's Opportunity puts you in the Biggest and Most Profitable Business in the world and establishes a lifetime income. Every auto owner will welcome your solution for his biggest replacement-problem expense. A very little consistent effort will net you $40 a day. No investment. We start you FREE. *Write now for complete information Dept. 59.*

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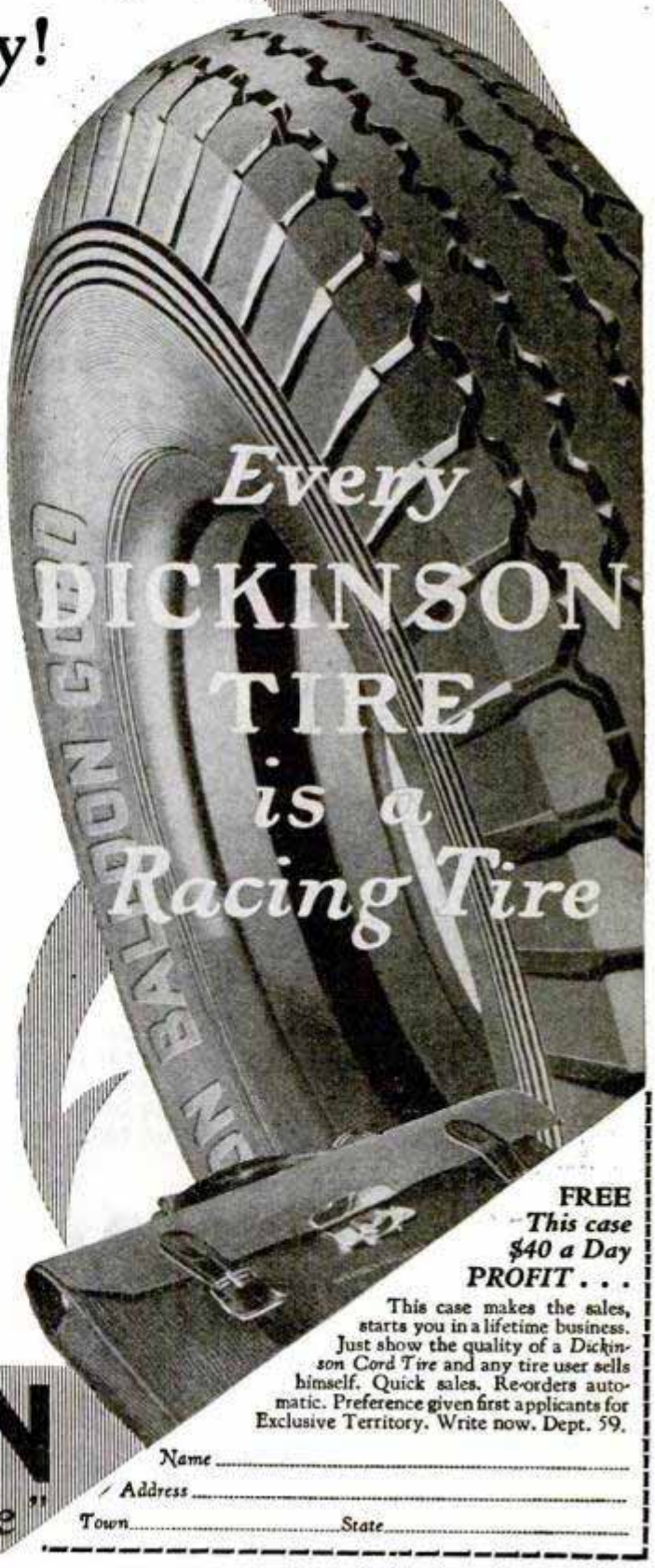
J. G. FEIST, *President*

Pottstown, Pa. *Address Nearest Branch* **Chicago, Ill.**



FREE
This case $40 a Day PROFIT . . .

This case makes the sales, starts you in a lifetime business. Just show the quality of a *Dickinson Cord Tire* and any tire user sells himself. Quick sales. Re-orders automatic. Preference given first applicants for Exclusive Territory. Write now. Dept. 59.

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Address _____

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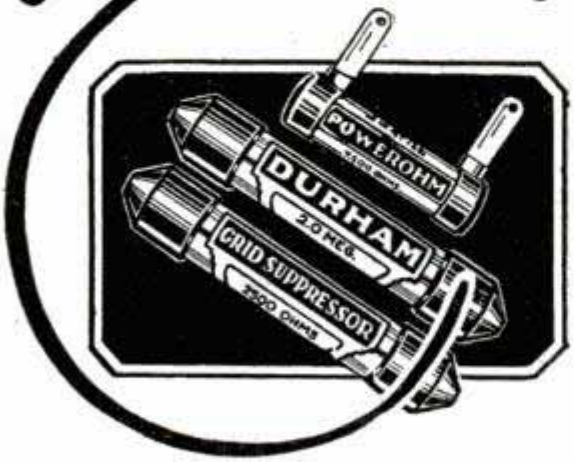
DICKINSON
"The World's Perfect Tire"

All Metallized



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for A-C Sets and Modern Circuits

NOW there is a DURHAM Resistor, Powerohm and Grid Suppressor for every type of radio receiver and every type of power supply unit—a full line of ranges—each using the famous Durham Metallized Filament principle, each supplied with standard or special tips to meet every modern radio requirement.

Durham Resistors are made in ranges from 500 ohms to 10 megohms.

Durham Powerohms (for "B" eliminators and Amplifier Circuits) are made in several power sizes, in ranges from 500 ohms and up.
Durham Grid Suppressors are made in ranges from 250 to 3,000 ohms in steps of 100. Absolutely NON-INDUCTIVE.

DURHAM METALLIZED
RESISTORS & POWEROHMS

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Guaranteed Waltham-Elgin WATCHES

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A YEAR TO PAY!

All Transactions Strictly Confidential
10 Days FREE Trial

Send only $1 with order, and your choice comes to you parcel post prepaid on **10 Days Free Trial.** Pay postman only $1 more on delivery; after free trial pay balance in 12 equal monthly payments. Satisfaction guaranteed or your money back.

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BF1—Newest model **Waltham** or **Elgin** nationally famous, gentleman's strap watch. 20 year warranted green gold filled case; radium dial; guaranteed timekeeper. $1.87 a mo. Specially priced $24.50
Order today with absolute confidence
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Thousands of special values in genuine diamonds, watches and jewelry illustrated. Free to adults only—write now for your copy.
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warns away prowler and sneak-thief from home, garage, barn or chicken house. Patented, guaranteed signal bell rings 2 minutes when doors or windows are tampered with. NOT ELECTRIC. No upkeep expense. Quickly installed. Mounts in small space. Handsomely finished in oxidized copper or nickel. Door or window style in either finish.

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BIG PAY NOW!

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LIBERTY PAINT CO.
Dept. 104, 68th and So. Narragansett St., Chicago, Ill.

Save $7 on this big Fire Toy SPECIAL 30 day offer

TO make room for new models, we give you this unheard-of opportunity. A big red Kingsbury Hook and Ladder Truck—35 in. long—for only $5! Usually $12 to $15 in the stores. Bright nickel-plated ladders, balloon size rubber tires, automatic gong, patented steering handle, hose, basket, etc. Sent, express collect, for $5. Or C. O. D. on receipt of $1 deposit. Money back if you're not delighted. Send today—this offer ends April 30th. **Kingsbury Mfg. Co., 83-D Myrtle St., Keene, N.H.**

Send 10c for Kingsbury disc wheel "balloon" tire Eraser

EARN $75.00 a week in Your Spare Time

JOINING the Radio Association enables you to cash in on Radio *now!* Follow its success-proven plans and you can earn $3 an hour, in your spare time, from the very first. Over $600,000,000 is being spent yearly for sets, supplies, service. You can get your share of this business and, at the same time, fit yourself for the big-pay opportunities in Radio.

Founded on a New Idea

Members of the Association do not wait for months before they make money out of Radio. Without quitting their jobs, our members are earning $25 to $75 a week spare time by building "tailored" radio sets, serving as "radio doctors," selling ready built sets and accessories, or following one of the many profit-making plans of the Association.

Earned $500 in Spare Hours

Hundreds earn $3 an hour as "radio doctors." Lyle Follick, Lansing, Mich., has already made $500 in spare time. Werner Eichler, Rochester, N. Y., is earning $50 a week for spare time. F. J. Buckley, Sedalia, Mo., is earning as much in spare time as he receives from his employer.

We will start you in business. Our cooperative plan gives the ambitious man his opportunity to establish himself. Many have followed this plan and established radio stores. Membership in the Association has increased the salaries of many. Scores are now connected with big radio organizations. Others have prosperous stores.

A year ago Claude De Grave knew nothing about Radio. Today he is on the staff of a famous radio manufacturer and an associate member of the Institute of Radio Engineers. He attributes his success to joining the Association. His income now is 350% more than when he joined.

What a Membership Can Do for You

1—Enable you to earn $3 an hour upwards in your spare time.

2—Train you to install, repair and build all kinds of sets.

3—Start you in business without capital, or finance an invention.

4—Train you for the $3,000 to $10,000 big-pay radio positions.

5—Help secure a better position at bigger pay for you.

6—Give you the backing of the Radio Association.

A MEMBERSHIP NEED NOT COST YOU A SINGLE CENT

Doubled Income in Six Months

"I attribute my success entirely to the Radio Association," writes W. E. Thon, Chicago, who was clerk in a hardware store before joining. We helped him secure the managership of a large store at a 220% increased salary.

"In 1922 I was a clerk," writes K. O. Benzing, McGregor, Ia., "when I enrolled. Since then I have built hundreds of sets—from 1-tube Regenerative to Superheterodynes. I am now operating my own store and my income is 200% greater than when I joined the Association. My entire success is due to the splendid help it gave."

Easiest Way Into Radio

If ambitious to become a Radio Engineer, to fit yourself for the $3,000 to $10,000 opportunities in Radio, join the Association. It gives you a comprehensive, practical and theoretical training and the benefit of our Employment Service. You earn while you learn. You have the privilege of buying radio supplies at wholesale. You have the Association behind you in carrying out your ambitions.

ACT NOW—if you wish Special Membership Plan

To a limited number of ambitious men, we will give Special Memberships that may not—need not—cost you a cent. To secure one, write today. We will send you details and also our book, "Your Opportunity in the Radio Industry." It will open your eyes to the money-making possibilities of Radio. Write today.

RADIO ASSOCIATION OF AMERICA,
4513 Ravenswood Ave.,
Chicago, Ill. Dept. PM-4

Gentlemen:
Please send me by return mail full details of your Special Membership Plan and also copy of your book, "Your Opportunity in the Radio Industry."

Name.....

Address.....

City.....State.....

For use on
110—120 Volt
A. C. Lines

The PEERLESS is small, thin and compact. Slides into small spaces, table type cabinets, etc. Case is heavy steel, maroon crackle finish. Comes complete with cord and separable plug.

The Most Sensational "B" Eliminator Announcement Ever Made!

Now—you can buy as good a "B" Eliminator as is possible to build—at a price that won't cramp your purse. Now—you can enjoy the thrill of louder, clearer, better reception that a good "B" Eliminator affords. And you buy the PEERLESS without risk of any kind, for it is backed with a

2 Year Guarantee

This astounding offer is without a precedent. Never before has such a value been offered. A "180" volt "B"—a "B" that will run your set and a power tube too—and guaranteed for two long years—at the ridiculously low price of only $12.45.

Uses
85 Mil. Tube
Delivers

180 VOLTS

Because of its very low price, don't confuse the PEERLESS with Eliminators which deliver only 90 or 100 volts. Also, don't confuse it with chemical type Eliminators. The PEERLESS uses the standard 85 milliampere gas-filled Raytheon or Q. R. S. rectifying tube. It is dry. No water, no acids to add. Requires no attention whatever. Delivers pure, hum-free "B" current of 22½—45—90—135 and 180 volts. Out-put Voltage taps are fixed. No adjustments. Will run any set. Will operate *any* power tube requiring no more than 180 volts. Will not "motor-boat" on superheterodyne receivers. Operates resistance-coupled audio amplifiers, when other "B" Eliminators fail. In every sense of the word, the PEERLESS provides the finest kind of "B" Eliminator performance—at only $12.45. Why pay more?

TUBE FREE

Special Introductory Offer

This is the first announcement of this new, super-powered, better quality guaranteed "B" Eliminator. Its regular price is $12.45 without the rectifying tube. But, as a special introductory offer to get thousands of these units out on sets, we will include, for a limited time only, a genuine $4.50 Q. R. S. 85 Mil. Tube free with your order. Think of it! A 180 Volt "B"—a 2 year guarantee—the privilege of trying it 30 days at our risk—and a $4.50 tube free—all for $12.45. Mail coupon now.

30 DAY TRIAL

Read all about this great new, better, tube type "B" Eliminator in the left column of this page. Then order it at once. Hook the PEERLESS up to your set. Compare the reception you get to that which you got before, or to that which you can get from any other "B" Eliminator. Put the PEERLESS to every test you can. Make it drive a "171" power tube, if that's the tube you use in your set. Enjoy this "B" for 30 days. Then—send it back, if you think that any other "B"—at any price is as good. We'll refund your money instantly.

$1 DOWN

MAIL COUPON TODAY

Send only $1. A dollar bill will do. We'll ship the PEERLESS "B" Eliminator at once. Pay the expressman $11.45 plus small express charges. Remember—you order the PEERLESS entirely at our risk. It is yours to test for 30 days. You get your money back promptly if within that time, for any reason whatever, you don't want to keep the PEERLESS. Order now. Fill in the coupon and mail today.

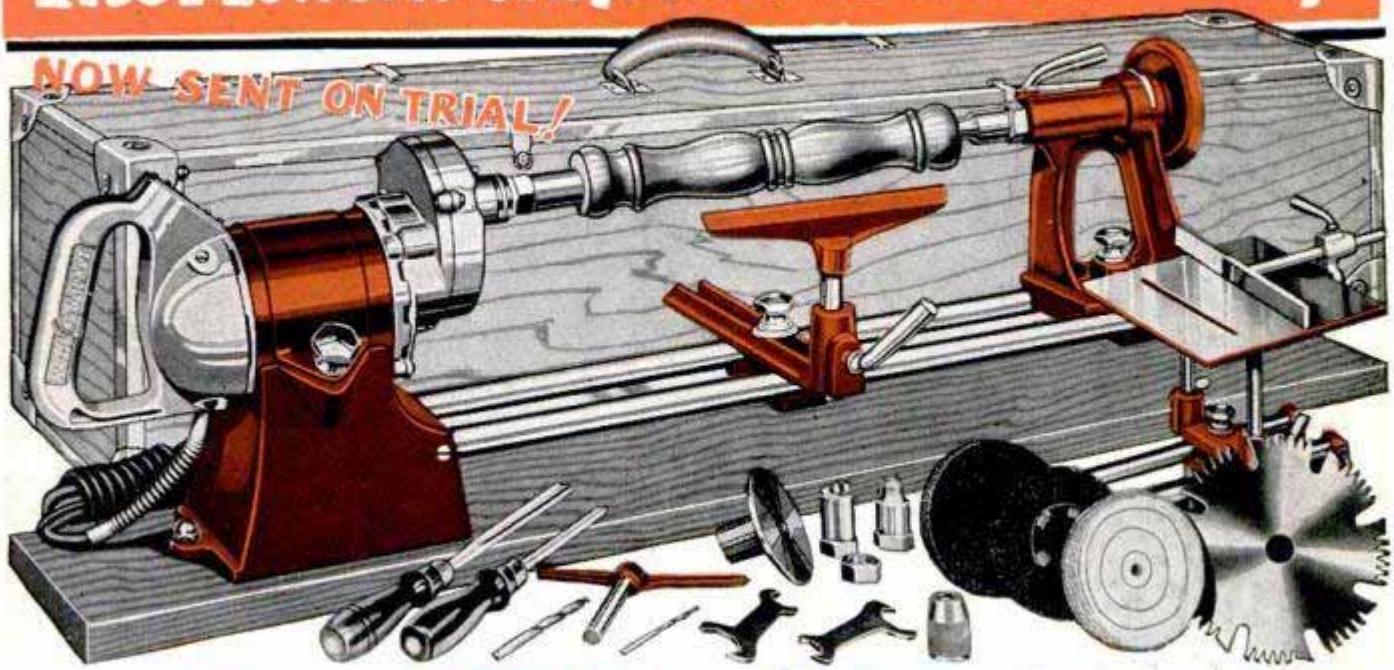
PEERLESS MFG. CO.
3981 Cottage Grove Ave.
Chicago, Ill.

Peerless Manufacturing Co.,
3981 Cottage Grove Ave., Chicago, Ill.
I enclose $1. Send me the 2 YEAR GUARANTEED PEERLESS "B" Eliminator and free 85 Mil. tube for 30 days trial. I agree to pay expressman $11.45 plus express charges.

Name.....
Street.....
Town.....
State.....

POPULAR MECHANICS PRESS
PRINTED IN U. S. A.

The Modern Craftsman's Wonder Shop



New 1928 Red Jacket Assembly

Five Thousand Red Jacket Craftsmen have made a bargain possible for you

Without Waco sales volume, no manufacturer could give the equivalent of *"Waco Shop No. 12"* at its price—*A Red Jacket Master Drill*, the *Waco Craftsman's Lathe*, the *electric power tools*, the *Jig Saw*, the *Red Jacket Band Saw*, or the Crafts Courses.

This equipment was designed, tested, approved and is guaranteed by Wm. L. Aylward, a nationally known craftsman and manufacturer, who has developed his hobby into a co-operative association of five thousand craftsmen.

Portable—Interchangeable—Complete HOME WORK SHOP

The new 1928 Combination of Electric tools brings you a Red Jacket Band Saw and in addition the powerful Red Jacket Master Drill Motor with direct drive to the Waco Craftsman's wood turning lathe (capacity 9 in. x 38 in.); a bench saw that has depth and side gauges, scroll and jig saw; and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to any light socket and converts your work bench into a complete private tool and machine shop.

It is a complete chest full of electrically driven tools designed by a master for the private use of tool lovers and men who create, repair and appreciate handy tools at home.

The WACO GUARANTEE
If it is not what you want when you get it—send it back

It Is Easy to Do These Things

Write or send coupon at once for valuable information to all interested in beautiful handiwork. It is free. It tells you how easy it is to operate a Red Jacket set of tools and lists the advantages and privileges that are free to member craftsmen. Don't miss knowing all about Waco. It is free. You are invited.

Look out for imitations. There is only one Red Jacket—one Waco—one Wm. L. Aylward, Mastercraftsman.

Special Crafts Course FREE

SPECIAL CRAFTS COURSE and blueprint service is free to Red Jacket Shop owners—all that there is to know about handicraft methods, raw materials, woods, carving, sawing, turning, designing, carpentering, decorating, is taught by special correspondence.

Buy On Your Own Terms

Only $10.00 down. Liberal discounts for cash. Easy monthly payment plans. It is no hardship to own a Red Jacket.

Complete Only $10.00 Down
10 DAY FREE TRIAL

SEND THE COUPON

Interesting Literature Free

Send the coupon. You will be surprised with all it contains. Beautiful, Instructive, Fascinating, Interesting.

Tilt Top Table

FREE Blue Prints

Red Jacket MASTER DRILL

The most elaborate and unusual drill motor ever designed as driving power.

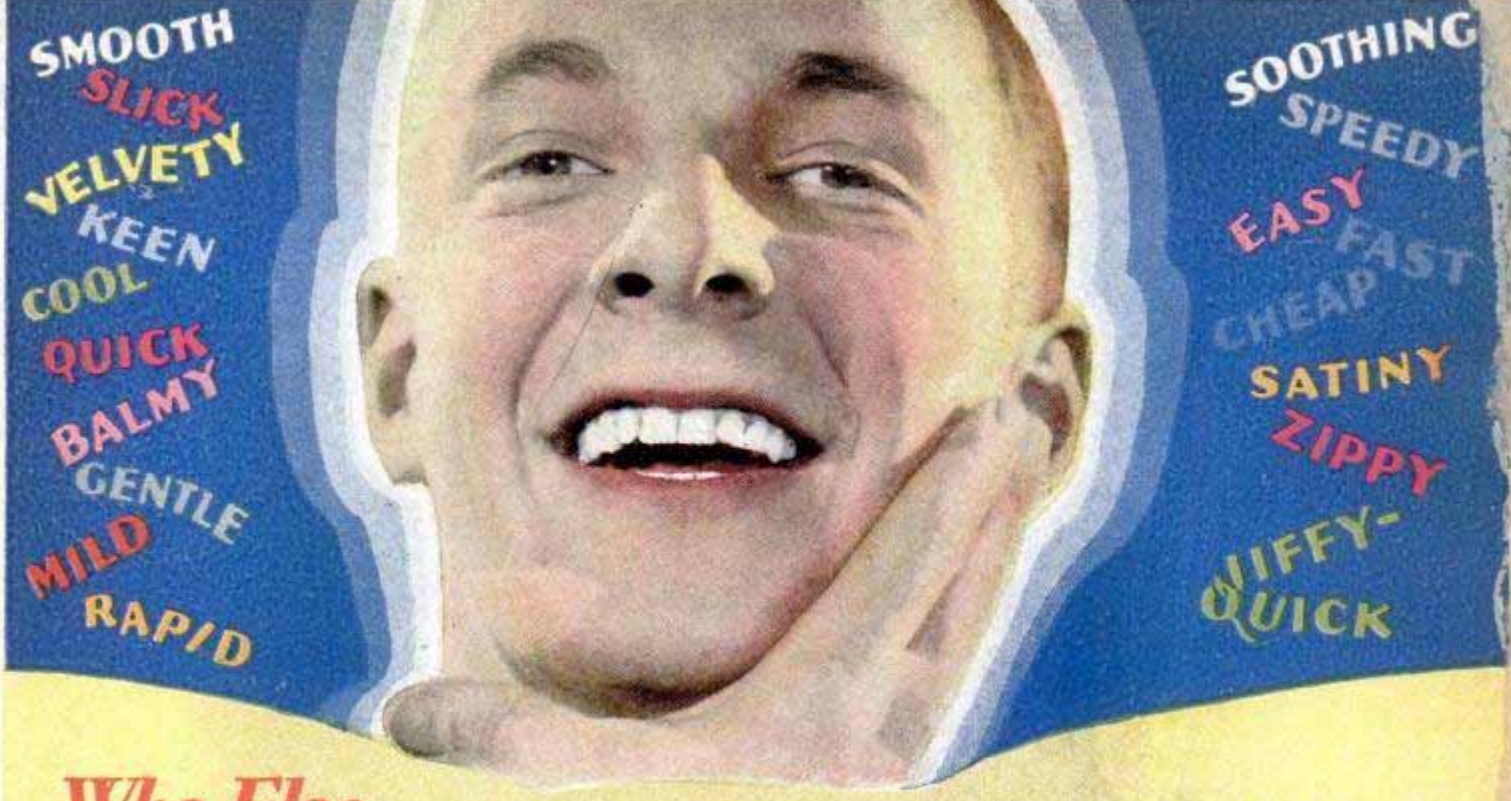
This Headstock furnished where no electricity is available.

WACO TOOL WORKS, Inc.
542 N. Parkside Ave.,
Chicago

Manager, Dept. 104. Please send me all free information and literature on Red Jacket Assemblies.

Name.....

Address.....



Who Else Wants Keen, Cool Shaves at Less Than ¼ Cent Apiece?

IMAGINE the joy of having a never-ending supply of super-keen razor blades always on hand! No more bother about remembering to buy new ones! No more "raking" and scraping with dull ones! . . . And all at an average cost of *less than a quarter cent apiece!* Think of it!

Today over *one-million* American men are enjoying this shaving comfort and economy . . . For KRISS-KROSS is absolutely unique. The way this remarkable invention *re-edges* razor blades is astonishing! The smoothest blade you ever encountered in all your previous shaving experience is just a *sample* of what KRISS-KROSS can give you day after day—and month after month!

Unique Invention

KRISS-KROSS is more than a stropper—for it makes blades last and *last*—and LAST! Many cases are on record where a single blade has stayed 100% keen for over 365 days of daily use! And thousands of men who formerly used a blade 4 or 5 days at best, now write us that 30 to 50 shaves are the very *least* they get since using KRISS-KROSS! Just figure the saving!

AGENTS: $50 A WEEK UP TO $200

KRISS-KROSS offers excellent money to reliable men who are willing to act as our local representatives in their home territories—full or spare-time. Many of our men are earning $50-$150 a week and even $200! Spare-time agents, too, often make $5-$12 a day just showing KRISS-KROSS to friends, fellow employees, etc. As example, L. M. Hamil of Tenn. made $20 in a single afternoon . . . We give you a very generous proposition and start you out with everything you need. Get details right away and see for yourself. Just check bottom line of coupon below and mail it to-day!

KRISS-KROSS sharpens any kind of razor blade on the market (except Durham). Uses the master-barber's secret diagonal stroke. Automatic pressure. Strops heavy at the start—light at the finish. Takes only 11 seconds. Automatic jig notifies you when your blade is ready with the *keenest cutting edge that steel can take!*

Special Offer Now

KRISS-KROSS is not sold in stores but is demonstrated by authorized representatives in each locality. If there is no representative near you, mail the coupon below for interesting, illustrated explanation of KRISS-KROSS with generous introductory offer. Also get details on special 3-way razor being given *free* . . . No obligation, so why not mail the coupon now!

Rhodes' KRISS KROSS STROPPER

RHODES MFG. CO.
Dept. D-372, 1418 Pendleton Ave., ST. LOUIS, MO.

Rhodes Mfg. Co., Dept. D-372,
1418 Pendleton Ave., St. Louis, Mo.

Without obligation, please send me illustrated booklet and special offer on KRISS-KROSS Stropper. Also give me details of patented, 3-way razor you are giving FREE.

Name.....

Address.....

City.....State.....

( ) Check here if interested in KRISS-KROSS money-making.